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REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1956

General

Sir Edward Salisbury, C.B.E., F.R.S., who had been Director of the Gardens for a period of thirteen years, retired on the 30th September, 1956. He was succeeded by Dr. George Taylor, Keeper of Botany in the British Museum (Natural History), who took over his duties on the 1st October.

Losses in the staff during 1956 include Mr. J. H. Hemsley, who left to take up a position under the Nature Conservancy, Miss Lewis, from the Australian Department, who left to get married, and Miss B. Borras, from the Library, who resigned. Acquisitions were Dr. D. H. Dalby, who will study Hepatics and Dr. N. K. B. Robson, who is attached to the African Department. Miss Jepson joined as Assistant Librarian. Another acquisition was Mr. G. E. Brown, who was appointed Assistant Curator in the Arboretum.

It is a pleasure to record that Dr. W. B. Turrill was honoured by the award of the Victoria Medal of Honour for his work on the Botanical Magazine on behalf of the Royal Horticultural Society.

The Herbarium

Some aspects of the normal activities are indicated by the following figures :—

Specimens received for the Herbarium, excluding those prepared at Kew from living material, 63,413 ; sheets received on loan, 11,351 (the majority of these were sent for determination by botanists for institutions abroad) ; sheets distributed as duplicates, 19,203 ; sheets mounted, excluding *Algae*, *Lichenes*, *Fungi*, and *Bryophyta* and specimens received already mounted, 58,197.

Visits by botanists numbered 4,455. As usual, a large number of our visitors were from Commonwealth and other countries overseas.

During the year a total of 2,500 enquiries and plant consignments have been dealt with by the staff of the Herbarium and Library alone. Many of the enquiries involved prolonged and often difficult research into taxonomic and other botanical problems, nomenclature, or literature.

As in previous years, a number of evening lectures, illustrated by films or lantern slides were given by Kew or visiting botanists. They were well attended and greatly appreciated by members of the staff and their friends.

Miss M. M. Whiting has given valuable voluntary service in the Tropical Asian department and this is acknowledged with gratitude. Mr. W. C. Worsdell has continued to assist various members of the staff by translating botanical papers from several languages. Many are indebted to him for this service.

Exhibits by Mr. A. A. Bullock and by Mr. E. M. Marsden-Jones and Dr. W. B. Turrill were set up and demonstrated at the rooms of the Linnean Society on 6 December at the President's reception.

Students' Day was held on 26 May. Members of the staff arranged a very large number of special exhibits to demonstrate some of the botanical research carried on at Kew. The exhibition, which was greatly appreciated, was attended by students and members of scientific societies.

The Keeper, Dr. W. B. Turrill, gave a course of lectures in Jugoslavia in April at the invitation of the British Council and Unesco. The lectures were given at Beograd, Skoplje, Sarajevo, and Zagreb on recent advances in the methods of plant taxonomy. Dr. Turrill has served on various scientific committees and has been appointed to represent botany on the Council of the British Association.

Mr. C. E. Hubbard has continued to serve on the " Advisory Committee on Research designed to improve Sea Defences."

Europe, Orient and N. Africa. The flow of enquiries concerning " wild " and cultivated plants from Britain and the Continent continues unabated, and, as in former years, the task of dealing with this miscellaneous, routine work occupies a very large amount of the department's time.

Considerable progress has been made with mounting and laying in the large collections of specimens which had accumulated during the past two or three years. The greater part of Dr. P. H. Davis's valuable Turkish collectings (excepting those received during 1956) has now been mounted and laid into the herbarium, and a strenuous effort is being made to incorporate the beautiful specimens from the Thomas Birch Wolfe herbarium, received from Ipswich Museum. It is also hoped that many of the interesting, critical species contained in the late A. B. Jackson's collection may be accessible for study before the end of the coming year.

Mr. Meikle has completed drafts of *Ranunculaceae*, *Berberidaceae*, *Papaveraceae*, and *Fumariaceae* for the Flora of Cyprus, and is now working on the large family *Cruciferae*, which, he hopes to have dealt with before the end of spring 1957. Miss P. Z. Scammell (Colonial Office) and Mr. J. L. Gilbert (Colonial Office), appointed in the autumn of 1955 to assist with work on the Flora of Cyprus, have already given valuable service in compiling an index of Cyprus plant records, in identifying collections recently received, and in re-arranging material previously mixed with the

general Oriental collections. Their help should greatly facilitate and accelerate the production of the Flora.

Mr. L. F. Merton continues to give invaluable help, supplying carefully selected and pressed specimens of many Cyprus plants previously wanting in the Kew collections or else very inadequately or imperfectly represented ; the department is under a particular debt of gratitude to him for continuing his botanical explorations in the island under very difficult circumstances. He is now (temporarily, it is hoped) our sole resident collector in the area. Mr. Merton has kindly agreed to be responsible for the ecological and distributional data in the Flora, and it may be assumed that his extensive knowledge of Cyprus and Cyprian vegetation will also be available for checking, and, where necessary, amending other parts of the manuscript. The department is sorry to learn that Mrs. E. W. Kennedy has left Cyprus for Portugal, and will greatly miss her generous and meticulous help ; Mr. Edwards C. Casey, another valued collector, is studying in Britain, and will not be in Cyprus for some time to come. These losses have been partly offset by the gift of more than 1,000 Cyprus specimens from Miss G. E. Atherton ; her extensive collections are particularly rich in weeds of cultivated land, a group somewhat neglected by many botanical collectors.

Mr. R. A. Blakelock is furthering his studies on the flora of the Middle East : part II of his " Notes on the Flora of 'Iraq " was published during the year, and part III (*Caryophyllaceae*, including *Illecebraceae*) is nearing completion. Valuable collections of 'Iraq plants have been received from Prof. Emberger, Mrs. P. Grigg, Mr. E. R. Guest, Prof. R. Wheeler Haines, Mr. J. K. Jackson, Dr. G. Long, Mr. I. Mahullal, Dr. A. Rawi, Dr. H. E. Schwan, Mr. S. Y. Serkahia and Mr. Tikrity. Dr. E. R. Guest has contributed many helpful comments on problems relating to the flora of 'Iraq, and the department is also grateful to Mr. G. O. Allen for naming *Charophyta* from the area.

The National *Dianthus* Collection has been augmented during the year by small gatherings of seeds and plants from various parts of Europe and the Near East. Miss S. S. Hooper, Officer in charge of the Collection, returned from a holiday in the eastern Pyreness with a number of living plants of species and hybrids. About 80 species are now in cultivation in the Experimental Ground, including the majority of those grown in European Botanic Gardens, but there is still a need for additional material (seeds or cuttings) from the Balkan Peninsula and Asia Minor. A start has been made on a hybridization programme, and stock plants have been selfed to obtain seed for propagation and exchange. A number of plants have been received for identification, amongst them cuttings of the entire *Dianthus* collection at the Royal Botanic Garden, Edinburgh. Miss Hooper is also revising herbarium material of the genus, concentrating chiefly, at the moment, on the Oriental collections.

Miss I. Blewett, for many years European Assistant, was transferred to the Australian department late in 1956. Miss P. Halliday and Miss D. Pearson (part time) are giving attentive and appreciated service to the department.

Thanks are due to those visitors and members of the staff who presented specimens, or who examined and determined critical plants

during the past year : Mr. Peter Grubb returned from the Cambridge University Expedition to Yugoslavia with a very acceptable collection of plants, and Mr. N. Y. Sandwith has named and presented 265 plants from Northern Spain (Aragon)—an area rather poorly represented at Kew ; the department is also grateful to Mr. J. P. M. Brenan, Dr. J. G. Dony, Mr. R. Graham, Mr. D. H. Kent, Mr. J. E. Lousley, Dr. R. Melville, Mr. P. D. Sell, Dr. S. M. Walters and Dr. D. P. Young for their continued interest and assistance in matters pertaining to the European flora.

Northern Asia, China, Japan and India. The mounting and incorporation into the herbarium of the large collection made by Dr. Bor in Lahaul has been completed. Collections from Bombay presented some years ago by St. Xavier's College and Father Santapau, 200 Japanese plants received in exchange, 335 specimens collected in Upper Burma by the U.S. Typhus Commission and received from the Smithsonian Institute, gatherings from Pakistan received from the University of California, and material extracted from the Hong Kong and Greatrex herbaria, have been mounted and incorporated, as well as the considerable number of cultivated plants dried during the year. Exhibits were staged for Students' Day.

Enquiries, requests for loans, and identification of cultivated specimens sent for name have absorbed a considerable amount of time, as usual. A collection of cultivated *Weigela* specimens led to an overhaul of the herbarium material of this genus and a new arrangement.

Hemerocallis, *Iris*, *Tulipa* and *Camellia* were other genera given special attention, the MS. of the revision of Camellia being brought up to date, while the asiatic genera of *Crassulaceae* were re-arranged. Further investigations were made in connection with Roxburgh's drawings and herbarium specimens, and the first part of the list of drawings has now appeared.

Tropical Asia. Mr. L. L. Forman has remained throughout the year on detached duty in Indonesia, at the request of the Government of that country. He has made several collecting trips to various islands in the Malay Archipelago, the results of which are not yet available.

A large number of specimens has been loaned to Leiden for the benefit of contributors to the *Flora Malesiana.* Every encouragement is given to such workers to visit Kew for the same purpose, as it is not possible to loan all the available material.

Thanks are again due to the authorities of various Forestry and Agricultural departments in the area for gifts of specimens, and especially to Mr. J. W. Purseglove, Director of the Botanic Garden, Singapore, for duplicates from collections made by himself and others. Work on the incorporation of this material continues.

Among many visitors, Mr. G. H. S. Wood, Forest Botanist, British North Borneo, has spent some months at Kew working on *Dipterocarpaceae.*

Tropical Africa. During most of the year the staff has been depleted by the absence in Africa of Mr. E. Milne-Redhead and Mr. P. Taylor who returned to Kew in August, but the Section was ably cared for during this period by Mr. J. P. M. Brenan. The vacancy caused by the tragic

death of Miss E. A. Bruce was filled in March by the appointment of Mr. J. R. Tennant.

During the year there have been various changes in the Assistants working in the Tropical African Section ; Mr. A. L. G. Sapper was transferred to another Section and his place was taken by Miss J. McEwan whilst Mrs. P. Taylor (née S. Patten) was similarly transferred and her place was filled by Miss A. Dunk.

Work has continued on the " Flora of Tropical East Africa "; but owing to the preparation of the account of the *Leguminosae*, the number of other families published during the year has not been great. These consist of *Canellaceae*, *Caryophyllaceae*, *Connaraceae*, *Menispermaceae* and *Rhizophoraceae*. Work on the *Loganiaceae*, interrupted by the death of Miss E. A. Bruce, has been continued by Mr. J. Lewis. Mr. J. H. Hemsley has nearly completed his account of the *Sapotaceae*, whilst Miss J. Elffers has done much work on the *Capparidaceae*. Mr. R. A. Graham has completed an account of *Polygonaceae* and Dr. R. Melville and Mr. R. A. Blakelock have practically finished their treatments of the *Gymnospermae* and *Celastraceae* respectively. Mr. J. P. M. Brenan and Mr. J. B. Gillett continue to make satisfactory progress with *Leguminosae*, in spite of their meeting with many difficult taxonomic problems. Dr. B. Verdcourt has submitted an account of *Alangiaceae* and is now busily engaged on the *Convolvulaceae*, whilst Mr. R. Ross continues to work on his account of the *Ericaceae*. Dr. B. Schubert of the U.S.A. Department of Agriculture, Beltsville, Maryland, U.S.A. has nearly completed her account of *Desmodium*. The Editors are most grateful to these and other botanists outside Kew who are so kindly contributing to the Flora.

In August, Dr. H. Wild, A.R.C.S., Senior Botanist to the Ministry of Agriculture, Federation of Rhodesia and Nyasaland, was seconded to this country for work on the " Flora Zambesiaca " and arrived during July. He will spend most of his time working in the Kew Herbarium. In December, Dr. N. Robson was appointed by the Colonial Office to assist Dr. Wild with the preparation of the " Flora Zambesiaca " and will divide his time between Kew and the British Museum (Natural History). An assistant to help with the increased routine work resulting from these activities, Miss A. E. James, was appointed in December, and a typist for the same project, Miss L. D. Whiteley, also started work during that month.

Mr. B. Beshir, Technical Officer of the Section of Botany and Plant Pathology of the Sudan Ministry of Agriculture, was attached to Kew for several months from October to gain experience in herbarium methods. He is proving to be a most useful helper in the Section.

Work on the revised edition of the " Flora of West Tropical Africa " has continued during the year. Mr. R. W. J. Keay has been occupied with the *Rubiaceae* and has undertaken a much needed revision of the numerous West African representatives in the *Randia–Gardenia* complex ; Prof. G. Erdtman has very kindly reported on the pollen morphology of a number of species in connection with this revision. A number of other botanists are collaborating in the revision of Volume II, Part 1 ; work on the *Scrophulariaceae* by Mr. F. N. Hepper, on the *Compositae* by Mr. C. D. Adams and on the *Labiatae* by Dr. J. K. Morton is well advanced. A most

welcome feature during the year has been the co-operation of French botanists in sending material to Kew for study in connection with the F.W.T.A. revision. Dr. R. Melville completed the manuscript of the Gymnosperms and prepared a revision of *Encephalartos* in Central Africa.

During the year Mr. Keay completed the correction of the proofs for Volume I, Part 2, which will occupy about 500 pages. The Supplement on the Ferns and Fern allies has been completed by Mr. A. H. G. Alston of the British Museum (Natural History), edited by Mr. Keay and sent to the printer.

During 1956 over 15,000 Tropical African specimens were laid out and mounted, and approximately 20,000 were laid into the Herbarium. As about 23,000 specimens were received during this period it will be seen that the routine work just failed to keep pace with the intake.

For two weeks in July and August, Mr. Keay attended the C.C.T.A./C.S.A. Reunion of Specialists in Phytogeography at Yangambi, Belgian Congo ; thanks are due to Unesco who sponsored Mr. Keay's visit.

Some of the more important collections received were made by Mr. J. G. Adam (French West Africa) ; Mr. H. D. Jordan and Mr. V. Marmo (Sierra Leone) ; Mr. J. T. Davey (French Sudan) ; University College of the Gold Coast (various collectors), Dr. A. L. Wharton (Gold Coast) ; Mr. J. F. Killick (Nigeria) ; Prof. Emilio Guinea (Fernando Po) ; Dr. H. F. Mooney (Ethiopia) ; Dr. P. E. Ellis (Somaliland) ; Mr. A. V. Bogdan, Dr. P. J. Greenway, Mrs. D. R. Tweedie, Dr. B. Verdcourt (Kenya) ; Mr. P. R. O. Bally, Mrs. H. G. Faulkner, Miss G. A. Nobbs, Mr. R. E. S. Tanner (Tanganyika) ; Mr. G. Jackson (Nyasaland) ; Mr. D. B. Fanshawe, Mr. W. D. Holmes, Mr. A. E. King, Mrs. H. M. Richards, Mr. E. A. Robinson, Mrs. J. M. Wright (Northern Rhodesia). Dr. G. W. Reynolds, who has continued his field investigation of *Aloe* in tropical Africa, has sent further beautiful specimens and photographs of members of this genus which have formed a most valuable addition to the Kew collections.

A large collection was made by Mr. E. Milne-Redhead and Mr. P. Taylor mainly in southern Tanganyika. The results of their expedition, which was made possible by the financial assistance of the Colonial Office, will do much to strengthen our knowledge of the flora of the Southern Province, particularly the Songea District.

The East African Herbarium, under the able curatorship of Dr. P. J. Greenway has continued to co-operate with Kew very closely. Large numbers of duplicate specimens collected by various correspondents in East Africa have been presented to Kew for the checking of names and the material of all families being worked on for the Flora has been sent on loan. Similarly, the Government Herbarium, Salisbury has continued to send large quantities of duplicate specimens to Kew, and now that work is starting on the " Flora Zambesiaca " considerable loans from that Herbarium are being received.

We have continued to receive valuable collections made by members of the Nigerian Forest Department and submitted through the Curator of the Forest Herbarium, Ibadan. These collections together with extensive loans from the Forest Herbarium, have been of great help to Mr. Keay in his revision of the " Flora of West Tropical Africa ".

As usual, many of our friends and collaborators abroad have visited the Herbarium during the year. Among these visitors working on problems concerning Tropical Africa are the following :—Mr. C. D. Adams, Prof. H. G. Baker, Dr. C. E. B. Bremekamp, Dr. T. Clifford, Dr. H. C. D. de Wit, Prof. P. Duvigneaud, Dr. C. Evrard, Dr. C. C. M. Gutjahr, Dr. O. Hedberg, Mr. H. Huber, Mr. I. Langdale-Brown, Dr. J. Léonard, Dr. F. A. Mendonça, Dr. J. K. Morton, Mr. A. Rocha da Torre, Prof. R. Schnell, Mr. C. G. Trapnell, Prof. Trochain, Dr. A. L. Wharton and Dr. R. Wilczek.

During the year Mr. J. P. M. Brenan continued to act as librarian to the Association pour l'Etude Taxonomique de la Flora d'Afrique Tropicale ; one Bulletin was issued by the Association as well as the annual A.E.T.F.A.T. Index which is so valuable as a reference work to current research on African plant taxonomy.

Apart from specimens from the East African Herbarium, the Government Herbarium, Salisbury, and the Forest Herbarium, Ibadan already mentioned, valuable duplicates have been received in exchange from various institutions : Professor Dr. W. Robyns has continued to send us very fine sets of duplicate material from the Belgian Congo. We are also most grateful to him for sending us a small collection of specimens collected by Dr. H. J. Schlieben in Tanganyika, many of which are isotypes. Duplicates have also been received from the Jardim e Museu Agricola do Ultramar, Lisbon, which included many plants from Portuguese Guinea, a territory hitherto poorly represented in the Kew Herbarium, whilst the Institute of Botany, Faculty of Science, Lisbon, presented some duplicates from the historic Angolan collection made by Dr. F. Welwitsch. The Imperial Forestry Institute, Oxford, has presented, in continuation of exchange, many useful specimens, mainly of woody plants. In return, fine sets of African plants, chiefly from East Africa, and including duplicates from the collections made by R. B. Drummond and J. H. Hemsley, totalling in all over 9,000 sheets, were distributed during the year to many Institutions.

South Africa. The normal period of secondment was extended to enable Mr. D. J. B. Killick to remain at Kew throughout the year. He has continued his work on *Myrica* and *Eriospermum*, but the greater part of his time has been taken up by routine enquiries from Pretoria, especially on the family *Cucurbitaceae*.

Thanks are again due to Dr. Dyer at Pretoria and Dr. Schelpe at the Bolus Herbarium for gifts of large numbers of specimens and photographs. These are being incorporated.

Australasia. During the year about 1,200 duplicate specimens from Australian herbaria were received and have been mounted and incorporated in the herbarium. Considerable progress has been made in mounting plants in the Melville collection and the names have been checked of the majority of *Proteaceae*, *Leguminosae*, *Epacridaceae* and *Compositae*.

Mr. P. F. Morris, Melbourne Botanic Garden, was attached to the herbarium for nine months during which time he studied the Australian native and introduced *Pelargoniums*, the genus *Xanthium*, and various *Gramineae*, notably *Danthonia*. Among the visitors, Mr. D. Symon, Waite

Institute, Adelaide has worked on the Australian *Cassiae* and Mr. H. U. Stauffe on a monograph of the genus *Exocarpus* and Dr. B. J. Grieve on the Western Australian flora. Among other visitors were Dr. S. Smith White, Sydney University, Prof. and Mrs. H. D. Gordon, Victoria University College, Wellington, Mr. E. Lawrence, Director of Agriculture, Tonga, and Mr. W. (Bill) Harney.

America. Work has continued with the identification of the extensive Hinton collections from Mexico. Large quantities of unidentified specimens received some years ago from the Instituto Agronômico do Norte, Belém, Pará, were named and incorporated. At the end of the year several weeks were devoted to the protection of type specimens in special folders, a task which is still not completed.

Work on tropical American *Bignoniaceae* included the examination of a large consignment of specimens sent on loan from the Leningrad Herbarium, as well as the study of collections received from the United States National Herbarium, the New York Botanical Garden, the Chicago Natural History Museum, the Utrecht Herbarium, Dr. E. Yale Dawson (Los Angeles County Museum), Dr. A. Ducke (Brazil), Dr. A. Macêdo (Brazil) and Dr. R. Reitz (Brazil).

A welcome visit was that of Dr. Bassett Maguire, of the New York Botanical Garden who, with his wife, spent some weeks in taking photographs of type specimens and copying the Schomburgk letters and field-notes. Another visitor was the British Council Scholar, Dr. H. A. Fabris, of the Museo de La Plata, who is spending 10 months at Kew, studying the *Bignoniaceae* and *Gentianaceae* of Argentina.

Orchidaceae. Many living plants were determined during the year, from the Gardens and from outside growers, of which Mr. L. M. Mason and Messrs. Sanders were again the chief contributors. Dried specimens from many countries, but mainly from Africa and Cyprus, were dealt with in the ordinary course of routine work. Mr. G. C. K. Dunsterville sent further drawings of Venezuelan orchids, again named by Mr. L. A. Garay. These now form a valuable addition to the collections and are continually proving of use in the determination of living plants and other American orchid material.

Research was again carried out on African orchids, particularly in connection with the Floras of that continent now being prepared at Kew. This covered a wide field but has been concentrated mainly on the genus *Eulophia* and allied genera and on *Bulbophyllum*. A paper was published during the year containing last year's work on *Polystachya* and some of the results of the work mentioned above is included in a further paper now awaiting publication. Research is still being continued, in the time available, on various Asiatic orchids.

Gramineae. The number of grasses received for naming and/or presented continues to increase from year to year. Whilst most specimens come from Commonwealth countries in Africa, collections from other parts of the Old World are still rich in numbers and representative of a large number of countries, including parts of southern and central Europe, Iraq, Pakistan, India, Siam, British North Borneo and New Guinea. Comparatively few specimens have been received from America, but these include a particularly valuable collection of tropical American

grasses from New York Botanic Garden and some rare species from the Smithsonian Institution, Washington. African grasses comprise important series of specimens from Ethiopia (H. F. Mooney), Kenya Colony (A. Bogdan), East African mountains (O. Hedberg, Uppsala ; and R. Ross and H. A. Osmaston, British Museum), East Africa generally (East African Herbarium, Nairobi), Nyasaland (G. Jackson), Northern Rhodesia (J. Hinds), Gold Coast (R. Rose-Innes), and Nigeria (D. Clayton). Extensive collections of South and South West African grasses have been donated by the National Herbarium, Pretoria, Belgian Congo grasses by the Brussels Herbarium, Southern Rhodesian grasses by the Government Herbarium, Salisbury, Russian grasses by the Academy of Sciences, Leningrad, and Australian grasses by the Canberra Herbarium. Isotypes of new species collected by Peter and by Schlieben in Tanganyika have been given by the Berlin and Brussels Herbaria respectively.

Numerous enquiries on a wide range of subjects pertaining to the study and uses of the *Gramineae* have been dealt with, such as grasses of value for the consolidation and prevention of erosion of sand-dunes, earth-banks and mud flats, sources of seeds and plants for cytological and other studies, grasses for lawns at home and overseas, areas of distribution of species, and nomenclatural and taxonomic problems. Assistance in many ways has been given to numerous visitors, and several manuscripts have been read for their authors and lists of names checked before publication.

The revision of genera and the preparation of the texts for the Floras of Tropical and East Tropical Africa have been continued. Accounts have been prepared for publication of a new genus of the *Chlorideae*, *Richardsiella*, from Northern Rhodesia, an annual species of *Eleusine* widespread in Africa and related to the Finger Millet, *E. coracana*, and of several new genera and species from the extremely rich and excellently prepared collections made in East Africa by A. A. Bullock, and by E. Milne-Redhead and P. Taylor. Types and other specimens in the Linnean Herbarium have been matched as accurately as possible with specimens at Kew, and a note concerning each prepared for future publication.

Mr. Hubbard has continued to attend the meetings of the " Advisory Committee on Research designed to improve Sea Defences ", and in this connection has visited various parts of East Anglia and southern England to inspect coastal vegetation. An investigation of *Spartina townsendi* H. & J. Groves has shown that this name should be applied only to the male-sterile primary hybrid, *S. maritima* × *S. alterniflora*, and not to the seed-bearing plant extensively planted for the control and prevention of coastal erosion in temperate regions.

Cyperaceae. Many collections from various countries, but especially from botanical establishments and private persons in Tropical Africa, in 1956, have been determined and added to the Herbarium. Prominent among these collectors is Mrs. E. A. Robinson who sent us a large number of well-collected sedges from Northern Rhodesia.

In connection with the Flora of Tropical East Africa, a revision of the remaining sections of the genus *Scleria* (Sect. *Hypoporum* had already been

revised) was completed and published. From these publications an appropriately modified account was prepared for the Flora.

Numerous queries of a varied nature have been dealt with during the year. Help has been given to visiting botanists researching in the family.

Vascular Cryptogams. The rearrangement of the collections hitherto included in *Dryopteris* sens. lat. has now been concluded and the segregate genera isolated and separately indexed.

Some preparatory work has also been carried out on the proposed supplement to Christensen's Index Filicum. A collection of over 100 sheets of ferns and fern allies, mostly Indian, was presented by Prof. A. Abrahams of Travancore University. These had been worked out cytologically and the supplying of names proved to be more time-absorbing than was at first anticipated.

In addition to naming old collections from various areas and other work of a routine nature, investigation continued on Tropical African ferns.

Visitors during the year included Dr. W. A. Sledge (Ceylon ferns), Prof. R. E. Holttum (Malayan Ferns), Mr. K. V. Kramar (*Lindsaea*) and Mr. T. Walker (Pteris).

Bryophyta. A start has been made with the rearrangement of the moss collections to bring the genera involved more into conformity with the smaller taxa now accepted by bryologists. In the new arrangement the genera are based on those of Brotherus in Die Natürlichen Pflanzenfamilien (2nd edn., 1924). At the end of the year one third of the collections had been dealt with. Specimens presented during the year include collections of mosses from Uganda (P. R. O. Bally), and liverworts from tropical Africa (O. Hedberg and E. W. Jones) and New Zealand (Mrs. E. A. Hodgson).

Fungi and Lichenes. Much time has been devoted to the determination of extensive collections of Aphyllophorales submitted by correspondents in Sierra Leone, India, Malaya, Victoria and Brasil. Attention has otherwise been directed largely to revision of tropical species of *Stereum* and *Xylaria.*

Acquisitions during the year include an important set of 100 alpine micro-fungi presented by Dr. E. Müller to the British Mycological Society and deposited by them at Kew, also a collection of 407 fungi obtained by the senior mycologist in Norway. Noteworthy, too, is the abundant material of *Puccinia rossii* Bubak secured by Mr. Sandwith in the Spanish Pyrenees and determined by Dr. Jörstad. The species was previously known only from the type collection made in Sicily in 1898. Numerous tropical collections of *Cladonia* species have been revised or determined by Prof. H. des Abbayes, see Kew Bull. 1956 pp. 259–266. A valuable set of 34 Japanese *Geoglossaceae* has been received from Dr. Sanshi Imai.

Visitors who worked in the department during the year included Mrs. Amos from Buenos Aires (Pezizales), Prof. Pinto Lopes from Lisbon (Polyporaceae), Mr. P. D. Orton (Agaricales) and Mr. J. T. Palmer (Nidulariaceae).

The assistant mycologist attended the Spring Foray of the British Mycological Society at Flatford Mill, Suffolk, and represented Kew officially at the International Mycological Congress in Brussels from 15th to 22nd September.

Algae. Collections of marine algae from Australia and East Africa have been identified, and additional material of the tropical genus *Eucheuma* has been received for examination.

Interesting collections of seaweeds acquired during the year include about 200 New Zealand specimens, some of them collected by the well-known botanist David Lyall, presented by Miss M. Foster-Barham. In addition to the above, a collection of seaweeds mainly from Britain and New Zealand, has been extracted from the herbarium of the late B. T. Lowne. A small collection of West Indian seaweeds has been received as an exchange from the Science Museum, Institute of Jamaica. Miss C. I. Dickinson has collected about 600 specimens in different parts of the British Isles ; some of these will be retained where the Kew collection lacks recent material ; the remainder will be used as duplicates for exchange with foreign herbaria.

Visitors to the department included Professor T. Rayss (Hebrew University, Jerusalem), at present working on the *Phaeophyceae* and *Rhodophyceae* of the Palestine coast ; having already published an account of the *Chlorophyceae*. Professor R. D. Wood (University of Rhode Island), an authority on the *Charophyta*, was another welcome visitor. Short visits were also paid by Miss M. de Valera, Mr. P. Dixon, Mrs. V. Krishnamurthy, Miss C. MacFarlane and Mr. H. Powell.

Gardens Herbarium. This herbarium, designed for use as a reference collection by the Curator and his staff and now housed in Descanso House, has been placed in charge of Mr. Sealy. The collection of specimens of tender plants formed chiefly by William Watson (sometime Curator at Kew) has been merged with the herbarium of woody plants (known as the Arboretum Herbarium) which was formed principally by two other Curators, George Nicholson and William Jackson Bean. A considerable amount of additional material has been laid in during the year, and new covers provided where necessary. The arrangement of families and genera follows that of Bentham and Hooker's Genera Plantarum, and a card catalogue of the genera is being compiled to facilitate reference.

Spirit Collection. The number of gatherings added to the collection during the period (just over 600) was fewer than in recent years, but this is due to the fact that specimens are incorporated in large batches and one such batch was not quite ready for incorporation at the end of the year. As in previous years the family *Orchidaceae* was represented by the greatest number of specimens, while there were also considerable additions of *Rosaceae* and *Asclepiadaceae*. The outside labels on over 200 bottles of orchids had to be changed as a result of research on various genera of the family. The spacing out of the *Orchidaceae* bottles into additional cupboards was completed during the year, thus relieving considerable congestion.

Many valuable collections were received for determination, in conjunction with dried specimens, the most notable being that collected by

by Messrs. Milne-Redhead and Taylor during their recent visit to Tanganyika. It will be some time, however, before these are all ready for incorporation.

Carpological Collection. Several hundred additions have been received and incorporated.

Fumigation Apparatus. The large fumigation chamber was used on 11 occasions during the year : the small chamber on 31 occasions. Both machines functioned satisfactorily. The only outbreak of insect attack in the Herbarium occurred in the Polyporaceae and as a result a large number of specimens of this family were fumigated.

Index Kewensis. The compiler and her assistant have made excellent progress with the preparation of Supplement XII.

Icones Plantarum. Two parts of this, ser. 5, vol. 6, parts 2 and 3, were published during the year. It contained figures and descriptions of plants, of various families, from specimens preserved in the Kew Herbarium.

Botanical Magazine. Two parts of volume 171 were published during the year. They were edited at Kew by Dr. W. B. Turrill for the Royal Horticultural Society. Of the 22 articles, 19 were contributed by members of the Kew staff. The high standard and originality of both plates and text have been fully maintained. The President and Council of the Royal Horticultural Society have presented the originals of the coloured plates and black and white text figures to the Kew Herbarium.

Drawings of British Plants. Miss S. Ross-Craig has continued her work on this series. Part IX (*Rosaceae*, part 2) was published during the year and Part X (*Saxifragaceae* and *Crassulaceae*) is in the press.

The Library

The routine work of the library has followed more or less the same pattern as in previous hears. Enquiries for biographical and bibliographical information have been as numerous as usual and in some cases have occupied a considerable amount of time.

During the year a number of books were sent to be bound, re-bound or repaired, and 250 boxes were bought to enable the library staff to accommodate the considerable number of reprints needing more space.

In August Miss D. M. Jepson was appointed to succeed Miss B. A. Borras who resigned earlier in the year.

Work on the classified catalogue proceeds at a steady rate and plans have been made to move this catalogue into the Central Library in the near future so as to make it available to all members of the staff.

To relieve overcrowding on the shelves certain periodicals have been moved from the corridors to the basement and our stock of duplicates together with the Frederick Adams collection of books on Diatomaceae have been placed in the stores where a room has been fitted up with shelves for this purpose.

A number of books have been presented to the library by the late Director, Sir Edward Salisbury, the Keeper, Dr. W. B. Turrill, and by various authors to all of whom we are greatly indebted. We have also

received a number of books from publishers for review in the Kew Bulletin.

Other publications and the continuation of a number of periodicals have been sent to us in exchange for the Kew Bulletin, for Hooker's Icones Plantarum (kindly presented for this purpose by the Bentham-Moxon Trustees), and for certain duplicate material.

A number of reprints from the library of the late H. W. Pugsley have now been incorporated in the library and members of the staff and others have, as usual, presented copies of botanical papers with customary generosity.

Many societies, academies and other institutions both at home and overseas have again kindly sent us valuable contributions of literature.

Loans have been made to other Government Departments, Agricultural Bureaux and similar institutions. Certain publications have been borrowed from other libraries for the use of members of the staff when the need has arisen.

We gratefully acknowledge the help given us by the Ministry's Photographic Department who have continued to provide copies of descriptions, botanical papers and rare works as required.

We are indebted to the Perkins Trust for the acquisition of Hoehne's Iconografia de Orchidaceas do Brasil, Plantas Aquaticas, and for two more parts of the Flora Brasilica, thus bringing our set up to date, and to the Trustees of the Stapf Memorial Fund for presenting another part of Nicholson's Orchids of Australia in continuation.

During the year Maps for the collection have been donated by the War Office, the Ordnance Survey and others, while the collection of drawings has been still further enriched by valuable contributions from other generous donors.

Department of Economic Botany

Museums of Economic Botany

The number of visitors making enquiries in regard to economic plants and plant products was greater than in the previous year. These enquiries were of a varied nature and included such subjects as —suggestions for obtaining seeds of some of the less known oil yielding plants for research work on vegetable oils : information about Portland arrowroot as prepared last century from *Arum maculatum* L. and a request to be allowed to examine specimens : suggestions for plants to grow in connection with certain special aspects of bacteriological work : information in connection with the production of Phormium fibre in Zululand and possible methods of bleaching : the artificial lighting of Hevea rubber seedlings grown under controlled conditions : advice on the correct colouring of oil yielding seeds and fruits, e.g. oil palm and coconut, in connection with publicity or poster work : suggestions in regard to logs of British trees that could be made to resemble logwood (*Haematoxylon campechianum* L.) for use in preparing a seventeenth century pirate film with scenes in the West Indies : information on economic plants for broadcasting purposes.

Enquiries dealt with by correspondence were equally varied. A specimen identified as *Cedrus atlantica* Manetti was said to have caused

deaths of cattle near Isleworth, Middlesex. There was some circumstantial evidence to support this assumption. The Cedars contain resins and aromatic substances which may be harmful if eaten in large quantities, but hitherto the trees have not usually been considered to be poisonous.

A sample of seeds said to have caused fatal poisoning in cattle was identified as Black Mustard, *Brassica nigra* (L.) Koch. Roots of Water Dropwort, *Oenanthe crocata* L., were received for identification from Guernsey. Two men had been severely poisoned by eating similar roots in mistake for parsnips.

So-called " Arnica " imported into this country from Mexico was found to consist of flower-heads of *Heterotheca inuloides* Cass. In Mexico an alcoholic extract of these flower-heads is used for treating contusions. True "Arnica", the dried flower-heads of *Arnica montana* L., is used similarly in Europe.

Several enquiries were received in regard to " Guar ", *Cyamopsis tetragonoloba* (L.) Traub. This Indian legume has long been grown as a fodder crop and as a culinary vegetable. In recent years a new use has been found for the seeds, as a source of gum for use as a stabilizer in margarine and salad dressing.

A plant apparently being sold in this country as " Shoo Fly Plant " was found to be *Nicandra physaloides* Gaertn. This coining of unnecessary common names is to be deprecated. A doubtful justification for this example may be found in the fact that the species is said to have been tried as a fly poison.

Another interesting plant dealt with in one enquiry was *Gymnema sylvestre* Br. The leaves of this Indian or tropical African plant have the power when chewed of destroying the sense of taste to sweet and bitter substances for a number of hours. Its action in altering the sense of taste is therefore similar to, but not identical with, the West African " miraculous berry " (*Synsepalum dulcificum* Daniell), which causes sour substances to taste sweet for some time after it has been chewed.

Other economic plants on which interest was centred during the year included the " lingon berry " (*Vaccinium vitis-idaea* L.) and allied fruits, the Puerto Rican cherry (*Malpighia punicifolia* L.), loquat (*Eriobotrya japonica* Lindl.), litchi (*Litchi chinensis* Sonn.), colocynth (*Citrullus colocynthis* Schrad.), tarragon (*Artemisia dracunculus* L.), tansy (*Tanacetum vulgare* L.), balm (*Melissa officinalis* L.) and cardamoms (*Elettaria cardamomum* Maton). Seeds which an Asian aircraft passenger had been chewing on his way to London and which were suspected of having caused his indisposition or illness were found to be Guinea grains (*Aframomum melegueta* K. Schum.). The passenger was said to have had a pounds weight or more of the seeds on his person.

The Keeper continued his investigations into the history and origin of certain tropical and sub-tropical fruits and further results were published during the year. Mr. S. G. Harrison carried out some observations on the effects of various conditions on the germination of North American wild rice (*Zizania aquatica* L. var. *angustifolia* Hitchc.). He was also able to resume his interests and work on the Coniferae.

Members of the Department have served on various committees during the year, including two of the Sub-Committees concerned with the revision of the British Pharmaceutical Codex.

Among the donations received during the year was a small but useful set of Sierra Leone woods, received from Mr. H. D. Jordan, all of which had been named from authenticated herbarium material. An exceptionally fine and large specimen (cross section) of lignum vitae (*Guaiacum officinale* L.) was also received.

The various buildings of the Department, six in all, required a good deal of attention in maintenance during the year, which is not surprising considering their age. The re-roofing or retiling of the Museum workshop, long overdue, was greatly appreciated. This has put an end to the constant leaks that have been such a source of annoyance for many years past, especially during storms and heavy rain. There is now no longer risk of damage to pictures or other delicate objects that have to be left exposed in the workshop while they are receiving attention.

A defective rain water pipe in the North Gallery led to damp coming through the west wall and match-boarding in the early part of the year. As soon as it was noticed the pictures on that part of the wall were removed. Fortunately no damage to the pictures had taken place, although in a few instances some of the plywood backs needed renewal. Owing to the length of time required for a thick brick wall to dry out thoroughly it has not yet, at the time of writing, been possible to replace the pictures.

Dampness of the stone floor at the east end of No. 3 Museum has been evident for some time past, although this floor is well above ground level. Investigation during the year revealed a leakage from a hot water pipe which has now been rectified. The taking up of the floor showed the old hot air passages or flues, well blackened, by which the building was originally heated when used as an orangery but which have not been used for nearly a century.

Distribution of Economic Plants

The propagation of Cacao was carried on actively during the greater part of the year and more Cacao plants were despatched from the quarantine house in 1956 than in any previous year. These consisted mainly of Cacaos from Colombia collected by the Anglo–Colombian Cacao Expedition of 1952 and forwarded to Kew in 1954 from the Imperial College of Tropical Agriculture. After a period of quarantine the plants were propagated by cuttings, and the rooted cuttings were then sent on to the West African Cacao Research Institute as material for use in plant breeding.

A variety of Cacao from a widely different source, "Lafi No. 7" from Samoa, was also propagated and distributed. This tree, of which material was received at Kew in 1955, has aroused wide interest by its reputation for high yield and possibly some measure of disease-resistance. During this year rooted cuttings were sent to Trinidad, West Africa, and Malaya for trial under differing conditions.

In the latter part of the year banana plants from various sources have occupied a large part of the quarantine space. Of particular interest are

some varieties of the diploid *Musa acuminata* Colla collected by N. W. Simmonds in New Guinea and Malaya. These varieties are being grown, and propagated in quarantine before going forward to the Imperial College of Tropical Agriculture for use in banana-breeding. A first consignment of two Malayan varieties was sent in August and it is hoped to have the rest ready to travel in 1957.

The need in the Cameroons for banana varieties resistant to Panama disease has prompted the introduction of varieties grown in the West Indies which show some degree of resistance. Two varieties sent to Kew during the summer for quarantine have been propagated, and it is planned to send them on the second half of their journey to West Africa next year. Other plants received from Trinidad were four species of fodder-grass which are being held for a period in quarantine at the request of the Director of Agriculture, Mauritius.

Arrangements were made for the introduction of several plants of minor economic importance for trial in new territories. A few seedlings of the tree yielding the illipe nut, *Shorea gysbertsiana* Burck, were sent to Calabar, Nigeria, but these failed to survive the change of surroundings. Better success was had with an earlier consignment sent to Benin, of which a few plants remain. Plants of the teastick bamboo or Tonkin cane, *Arundinaria amabilis* McClure, much valued in the making of split-cane fishing-rods, were sent to Trinidad and Nyasaland ; and plants of the brazil-nut, *Bertholletia excelsa* Humb. et Bonpl., to the Gold Coast. Some small plants of *Agave lecheguilla* Torr., were sent to the Bechuanaland Protectorate. This is a Mexican species yielding istle, a fibre used in brush-making.

Mr. T. A. Russell attended a meeting of the International Commission for the Nomenclature of Cultivated Plants held at Utrecht from 21st–23rd November as an agricultural representative with knowledge of tropical crops. The meeting was concerned with the giving of varietal names to plants in cultivation and during its course, proposals were made for a revised international code on the subject.

Jodrell Laboratory

Research

The outstanding event of the year is the progress that has been made with the research dealing with the systematic anatomy of the Monocotyledons. The Keeper has completed and revised descriptions of the leaves, and often of the culm as well, of all of the species of the Gramineae represented in the reference collection of slides. A draft of practically the whole of the forthcoming book on the anatomy of the grasses has now been written, and it is hoped that this will be completed and ready for the press before the end of 1957. A preliminary estimate indicates that the book will be at least 600 pages long. The numerous line drawings to illustrate the book have been labelled and made ready for the press. This considerable progress has been possible partly through the assistance, during some 3 months in the summer, of Miss R. Hungerbühler, a post-graduate student from Zurich, who labelled the drawings, and also made an intensive study of the micro-hairs on grasses in the slide collection. For this last purpose she also prepared a large number of supplementary microscope slides.

Another notable event with the work on Monocotyledons has been the publication in the Linnean Society's Botanical Journal of Dr. P. B. Tomlinson's important article on the anatomy of the Zingiberaceae which is based on the work he did at Kew and the University of Leeds.

Dr. M. Y. Stant's work on the anatomy of the *Alismataceae* is nearing completion, and she has also been engaged in comparing the structure of this family with that of the *Butomaceae* and also of a few of the aquatic species of *Ranunculus*.

Miss E. Smithson, of the Botany Department at the Northern Polytechnic, has completed a paper on the anatomy of the *Flagellariaceae*, which will shortly appear in the Kew Bulletin. Although this work was done mainly in Miss Smithson's own department it constitutes part of the programme of work on the Monocotyledons at the Jodrell Laboratory.

Professor L. K. Mann of the University of California, who was at the laboratory throughout the greater part of 1956, continued his very extensive and detailed investigation of the morphology and anatomy of the genus *Allium* and its allies.

Dr. P. B. Tomlinson returned to the Jodrell Laboratory for a short time at the end of the summer in connection with his study of the anatomy of the Palms, with special reference to the structure of the leaves. This work, originally started at Kew and at the University of Leeds, was continued at Singapore, and will now be pursued on the Gold Coast where Dr. Tomlinson has become a lecturer at University College, Achimota. The results of this research will be included in one of the forthcoming volumes dealing with the Anatomy of the Monocotyledons.

The Keeper was invited to make a contribution to a special volume of the Botanical Magazine of Tokyo to commemorate the retirement of Professor Ogura. He submitted an article entitled " Some Thoughts on the Structure of Bamboo Leaves " which is expected to be published shortly.

Besides the research concerning the anatomy of the Monocotyledons, the Dicotyledons have not been altogether neglected. The Keeper has completed papers on the anatomy of *Scyphostegia borneensis* Stapf, on the structure of *Sphenostemon*, and one dealing with papillae and fluted veins on the leaves of *Stephania zippeliana*. He has also collaborated with Dr. E. Bate-Smith of the Low Temperature Research Station at Cambridge in a study of the chemical nature and distribution of tannins in Dicotyledons, and a joint paper on this subject has been accepted for publication by the Linnean Society in their Journal of Botany.

The book entitled " Anatomy of the Dicotyledons " by C. R. Metcalfe and L. Chalk, which was published by the Clarendon Press at Oxford in 1950, is now practically out of print, and a second impression is being produced. Minor corrections for this new impression have been sent to the publishers, who have also agreed to publish a supplement in order to keep the original book up to date.

Routine Work

Routine work has been slightly less voluminous than in recent years, but all members of the staff have collaborated in examining some 160 samples and specimens microscopically with a view to establishing their

identity. The samples included such diverse objects as a piece of wood from Herod's palace at Jerusalem which was found to be *Juniperus oxycedrus* ; paper with coptic inscriptions made of Ensete fibre ; spherical objects from garden soil identified as the remains of hop fruits ; portions of musical instruments excavated by archaeologists ; and host plants of certain fungi which were identified for mycological colleagues. Acid resistant woods for accumulator crates were examined on behalf of the London Passenger Transport Board, and defective cork from mine sweeping cables on behalf of H.M. Underwater Countermeasures and Weapons Establishment. Other items that were identified included numerous timber samples, and tree roots that were alleged to have caused subsidences in buildings. Enquiries of a more physiological nature were also answered, dealing with such varied topics as colchicine treatment for seeds ; the copper content of bark and wood ; the ascent of sap and the absorption of water by trees. Assistance was also given to a " visual aids " firm who required information about, and illustrations of, oil producing plants.

The Keeper continued to serve on the " Crude Drugs Committee " appointed by the British Pharmacopoeia Commission to assist in revising the British Pharmacopoeia, and the work of this committee was completed towards the end of the year. He also addressed the Research Committee of the Fuel Research Board on the effect of atmospheric pollution on vegetation, and collaborated with Dr. L. Chalk of the Imperial Forestry Institute at Oxford in revising parts of the " Glossary of Terms used in Describing Woods " issued by the International Association of Wood Anatomists.

Slide Collection

Mr. F. Richardson and Miss D. M. Catling continued their all important work of preparing microscope slides for routine identifications, and for inclusion in the reference collection. Apart from 57 slides of miscellaneous timbers which have been added to the collection, special attention has been devoted to the Monocotyledons, and slides have been made of all of the available fixed material of the Gramineae, Cyperaceae, Restionaceae, Centrolepidaceae, Thurniaceae, Juncaceae, Philydraceae, Taccaceae, Velloziaceae, Hypoxidaceae, Haemodoraceae, Juncaginaceae, Xyridaceae and Lowiaceae. In all 328 slides of Monocotyledons were added to the collection during the year, making a total of over 3,400 slides of Monocotyledons. This is in addition to slides of aquatic Ranunculaceae and Butomaceae prepared by Dr. Stant.

Knife Sharpening Machine

Mr. Richardon has worked in close collaboration with an instrument maker on improvements to an electric microtome knife sharpener, originally designed by Dr. Shuster of Oxford for the Imperial Forestry Institute. He has also experimented with different grades of aluminium abrasives and different sharpening techniques used on this same machine. One outcome of this collaboration has been the commercial production of an improved model of the knife sharpening machine, which enables comparative novices to sharpen knives effectively without the long practice that was previously necessary to obtain good results by hand

sharpening. The machine also enables large knives to be evenly sharpened throughout the length of their cutting edges.

Visitors

The following visitors have worked at the laboratory during the year. Miss R. Hungerbühler, University of Zurich—Anatomy of Grasses. Professor L. K. Mann, University of California, Davis, California. He was awarded a Guggenheim Fellowship to enable him to work at the Jodrell Laboratory, and to visit a number of European countries, in connection with his work on *Allium*.

Dr. P. B. Tomlinson, University College of the Gold Coast. Anatomy of Palms, etc.

The Gardens

A bitterly cold February with nearly three months of drought to follow made the early part of the year a difficult one, but mid-summer brought with it the very heavy rains which continued well into the autumn. The attendance was the lowest for many years, with 987,835 persons entering the Gardens. The highest attendance was on Whit Monday, 21st May, when 48,550 were admitted, and the lowest on the 17th December when only nine people entered. May continued to be the most popular month of the year when nearly 300,000 people attended. Seed distribution continued to rise and 12,492 packets were despatched during the year. About 645 items of horticultural material were received. There was a considerable increase in enquiries both personal and by letter, the subjects ranging over a very wide horticultural field.

Arboretum Department

The prolonged severe spell which extended from January and through February delayed the normal winter-work programme, but it did enable a concentrated effort to be made upon the clearance of brambles, in particular, in the area bounded by the River-Side and Tulip Tree Avenues and Syon Vista. Owing to their free development from broken pieces of root left in the ground after grubbing, coupled with the heavy bird population as an effective dispersal agency, the Blackberry will always remain troublesome in the wilder areas of Kew. A " hormone " spray was also used during the early summer months, and the most effective applications were made over the areas " cleared " of brambles earlier in the year. The spray was applied while the suckering growths were only 12 in.–18 in. long and before they had broken through the canopy of Rhododendron foliage above them. The results were promising and warrant this treatment on a wider scale.

Despite the severe winter the losses were very light ; even many of the recently planted Eucalyptus near the Australian House escaped. *Eucalyptus niphophila* and *Eucalyptus alpina* are thriving. The plant of *Eucalyptus coriacea* which had grown near the Flagstaff for some years was, however, severely damaged and had to be removed. One rather exposed bed of *Rhododendron azaleoides* presented rather a ragged appearance for the remainder of the season. Later much of the Magnolia and Camellia blossom was spoilt by the spring frosts. *Magnolia macrophylla* produced a number of its large creamy-white blossoms and the plant is obviously

thriving. The Oso Berry, *Nuttallia cerasiformis* fruited this year. This was the result of hand-pollinating the female clumps by the Temperate House using material gathered from the male plant situated near the Ferneries.

With the continued drought, which extended through the spring and early summer, it became necessary to irrigate the Rhododendrons in early April. By late April the need for watering had become widespread until, by early June, even the Hollies in the Temperate House area needed a heavy soaking. The grass became brown and patchy, and mowing ceased altogether for about ten days. The wet season which followed resulted in good development among the various collections, although in some cases it came rather late, and did not coincide with the first flush of growth which is usually connected with the Spring and early Summer. Recently planted subjects were able to establish themselves very well.

A number of the collections have been " renovated " by replacement with young plants and freshly introduced species from the nursery. It has been decided to replan the Rose Dell and the Rose Species beds during the next two to three years, and with this in mind, a large scale propagation programme is under way. Some fresh material has been introduced. A considerable effort is also being made to increase the Ribes collection.

Our woodland trees provide an important feature. Some of the plantings made in past years have now reached the stage for thinning. A number of young trees, mainly Beeches, have been thinned so as to allow a number to develop into good specimens. This will to a large extent, offset the concern which is naturally felt over the removal of a number of the large Beeches, which work must unfortunately still continue. During the past year twelve large trees have been felled. The greater proportion proved to be completely hollow and many were infected with a Bracket Fungus (*Ganoderma applanatum*). A further attempt has been made to estimate the health and condition of the trees as a whole by tabulating the doubtful ones and compiling a " progress " report for each tree. The programme for future plantings of native trees has been considered and the necessary sowings made. The severe south-westerly gales of the 29th July caused considerable damage, particularly across the southern part of the garden. A large beech on the South boundary was snapped at ground level while several smaller trees, including two Walnuts, were blown out by the roots. Over sixty large limbs were blown down, while the number of smaller ones must have totalled several hundreds. But the damage, although severe, could have been much worse.

The main renovation work carried out during the autumn and early winter has been at the lakeside. The eroded banks on the eastern tip of the Lake had become overgrown with an ever widening margin of the Yellow Flag, *Iris pseudacorus* L. These banks have been made up and the work extended to connect with repairs made three to four years ago.

Pigeons continue to be troublesome but the numbers of grey squirrels have been considerably reduced. The department remains practically free of rabbits. Only twenty-one have been shot during the past year, but these have been free of Myxomatosis.

Botanics Department

For almost fifty years the Botanics has been regarded as a section of the Arboretum and came under the control of the Assistant Curator of that Department. Following the appointment of another assistant from 1st January 1956, it became a separate department. The line of demarcation between the Arboretum and the Botanics follows the path from Victoria Gate to the end of the Holly Walk, then along Princesses Walk to the cartroad and north to the lower nursery gate. The long cold spell of frosty weather early in the year interfered with replanting, the general maintenance work was, however, carried out and completed at the normal time. Planned alterations to several shrubberies and borders had to be postponed for the winter so that they would be completed in late autumn when conditions were more favourable.

The spring flowering displays were very good and crocuses in particular were outstanding. Recent additions to some of the plantings to provide more natural effects proved most attractive. The new plantings of more up-to-date varieties of Narcissi, particularly in the Wild Garden, brought about a great improvement and enhanced the display that is always a feature of this part of the grounds. Shrubberies near the Main Gate in which many of the bulbs used for forcing in the greenhouse some two years ago were planted, provided a mass of bloom, ample proof of the value of this type of bulb for naturalized planting.

Despite the cold and late spring Rhododendrons and Syringas flowered profusely. Many of the large groups of the former along the Broad Walk were magnificent, but as some of the older beds are declining rapidly, further replanting will be necessary if these displays are to continue. The Syringas flowered better than for many years past, the old groups being augmented by the collection of modern single flowered varieties planted some five years ago at the junction of the Princesses Walk and the cartroad. These plants have now become established and prove a great attraction to the public as the plants afford an excellent comparison of these new forms of Syringa with the old.

Many other trees and shrubs also flowered profusely and in particular the specimen trees of *Malus purpurea* and *M. lemoinei* were outstanding. The Crab Mound provided a wealth of bloom, but strangely enough the Japanese Cherries, normally one of the main attractions during May, gave a disappointing display, the foliage developing in advance of the flowers and thereby greatly detracting from their beauty. This applied particularly to the pink varieties. Other noteworthy features were the Forsythias, Philadelphus and Ribes. *Viburnum* × *bodnantense* flowered freely and it is evident that this is a first-class early flowering subject. In the Cumberland border the old Camellias did well whilst a number of the smaller bushes of newer varieties more recently planted helped to provide additional colour and interest. This Camellia Walk promises well for the future, especially if overcrowding can be avoided as development takes place. A specimen of *Helwingia japonica* and that of *Decaisnea fargesii* near the Main Gate were of particular botanic interest, the latter producing a number of its unusual fruits.

The excessively wet summer caused difficulties with grass cutting and often the lawns were only mown with great difficulty. The lush soft

growth continued until very late autumn, and even in December with its mild weather, grass seemed to be growing strongly.

The severe gale of the 29th July caused a number of losses amongst trees throughout the grounds generally. Undoubtedly they would have been much more severe had it not been the policy since the war of removing beech and other trees which were tending to become dangerous. Large limbs were blown out of many specimen trees and the extent of the gale damage can be gauged by the fact that two weeks were spent in clearing up the debris. Dangerous trees removed during the year included two large Elms, one on Victoria Gate lawn and the other on the Mound, both of which had been shedding limbs periodically.

Temperate Department

Resoiling of the last of the four centre beds in the Himalayan House was completed early in the year. The large specimen of *Rhododendron arboreum* which, as mentioned in the last report was left in situ, but was undermined and lifted with jacks from its previous very oblique attitude to the vertical, has shown no ill effects and now forms the main feature of the bed. In the course of replanting, the opportunity was taken to move from the Annex several of the larger Rhododendrons which needed more head-room.

The large *Araucaria excelsa*, which had stood for many years in the centre block of the Temperate House and after repeated cutting to keep it in bounds had completely lost its natural habit, was replaced at last by a young and shapely specimen. The increased light admitted by this change should prove beneficial to surrounding plants.

In both octagons, low concrete troughs have been built along the edges of the paths. With their selection of ferns and low foliage plants, these effectively conceal the pots of larger plants arranged behind them.

Paths in the Australian House have been surfaced with a bituminous preparation which makes them more resilient to walk on and has removed the danger of slipping on the previous excessively smooth surface.

Continuing the plan for replacing the largely derelict ivy hedge surrounding the Temperate House, five more sections totalling 75 yards have been replaced with rambler roses in the current year. This has involved a certain amount of returfing of banks and some stone walling near each stokehole tunnel entrance.

The border of shrubs, some of them rather tender, which surrounds the Temperate House, suffered more damage than usual this year during the severe weather experienced in February, and building repairs and repainting caused further damage, some of it inevitable. Most of the work was at the north end, and the majority of the Hebes from that part of the border were moved to the Nursery while it was in progress. When replanting in autumn, the opportunity was taken to improve the arrangement of the collection and to replace some of the older overgrown plants with young specimens. Few display labels have been written recently in view of the projected centralised labelling facilities, but as opportunity offers, labels are being produced in the department. Observations are being made on the permanence of different inks, paints and varnishes, but

production has been standardised on two main types. About 500 such labels have been produced during the year, this representing about 100 man hours, or half the estimated time expended annually on labelling.

Nine plants grown in the department have been figured for the Botanical Magazine in 1956, viz. *Acacia alata*, *A. cultriformis*, *Daphne altaica* var. *longilobata*, *D.* × *hybrida*, *Erica canaliculata*, *Grevillea* × *semperflorens*, *Hedychium densiflorum*, *Lagunaria patersonii* and *Russelia lemoinei*.

Among the more interesting and valuable contributions to the department received during the year, mention may be made of several consignments of seeds collected at high altitudes in the Hawaian Islands by Dr. J. F. Rock, a collection of *Agapanthus* species from Kirstenbosch per Mrs. F. M. Isaac, *Camellia* species and wild varieties from Okinawa per the United States Department of Agriculture, a new species of *Camellia*, *C. granthamiana* Sealy, from the Gardens Division, Hong Kong, seeds from the Monte Bello Islands and the Maralinga region of S. Australia collected by Mr. F. L. Hill, two mountain Rhododendrons from Dutch New Guinea per Prof. van Steenis, and seeds of *Suttonia kermadedensis* from the Kermadec Is. sent by the Parks Dept., Auckland, New Zealand.

The number of packets of seeds distributed from the department has declined slightly from the previous year. Despite a poor season, the number of items collected for distribution shows a further rise.

In conjunction with the Tropical Department a collection of Conifers, Acacias, Javanese hybrid Rhododendrons and foliage plants was staged at the R.H.S. Exhibition of 14th–15th February. A flowering plant of *Liparia sphaerica*, a S. African leguminous shrub with a decidedly proteaceous aspect, received a Cultural Commendation when shown on 17th April. At the invitation of the R.H.S. Camellia Nomenclature Sub-Committee, the department co-operated with the Arboretum and Decorative Department in supplying flowering specimens of every available variety for the Camellia Show held in April.

Decorative Department

The extreme cold weather experienced throughout February, when on several occasions 20° of frost were recorded, caused severe damage to the beds furnished with Wallflowers which became so crippled that they had to be taken out in March. The display of early and late Tulips underplanted with winter flowering Pansies, Aubretia and Arabis suffered little, and the colour display in all was well up to standard. The drought prevalent during the winter and spring months made it necessary to soak the whole of the flowerbeds before they could be dug ready to receive the summer bedding. This work was completed and the planting-out finished by the end of the first week in July, just in time to benefit from the early rains which continued throughout the rest of the summer. Wet conditions coupled with cold during day and night prevailed from July until the second week in September and this prevented the bedding plants from developing normally and only towards the end of September when warm sunny weather was experienced did the bedding really achieve its usual standard. The Palm House front was bedded out with many varieties of Pelargonium which made good growth but did not flower freely. On the Broad Walk varied subjects were used such as

Calceolaria, Salvia, Petunia, Fuchsia, Dahlia, Verbena and Penstemon, etc., the whole being so arranged that each opposite pair of beds matched but differed in each instance from the neighbouring beds. Outside No. 4, despite the bad summer, the Begonias of various types did well.

Rose Garden

The June display of flower though rather delayed by cold weather was particularly good and in addition to many new varieties which had been added of recent years some of the older ones still find favour with the public. Increased growth and healthier plants have resulted from the annual mulching which now takes place after pruning, when the beds are at the same time dressed with fish and bone meal. New varieties flowering for the first time this year were Beauté, Radar, Konrad Adenauer, Grace de Monaco, Bayadère, Rendez-vous, Soroya, and Grand Gala. The continuous rainfall during late summer suited most varieties of Rose and very strong growth was generally made. Despite the wet season very little Black Spot was to be seen.

Conservatory

The display throughout the year again showed the steady improvement that has continued of recent years, and large batches of well grown plants continue to attract visitors. In the spring forced Magnolias, Cherries, Malus, and other subjects were augmented by bulbous subjects like Narcissus, Hyacinths, Tulips, Dutch Iris, and others, providing a wealth of colour from January onwards. Later in the season the various glasshouse subjects such as Cyclamen, Gloxinia, Hippeastrum, Schizanthus, Streptocarpus, Primula, Euphorbia, and winter flowering Begonias continued the display until Chrysanthemums were brought into the house and remained to provide colour to the end of the year.

New Works

House No. 17F. has been rebuilt of teak and the opportunity taken to incorporate larger panes of glass so as to allow the maximum amount of light and give greatly improved growing conditions. In the Shaft yard a new store shed divided into three sections was built opposite the sterilizing plant so that both sterilized loam and incoming materials could be placed under cover. In the lower nursery, three new sectional leaf and compost bins have been erected, each having 5 ft. high sides and measuring 28 ft. × 18 ft. Immediately adjacent the site formerly occupied by a soil and rubbish dump has been cleared to allow of two new beds being formed which give some 800 sq. yds. of additional growing space for the department.

During the year 109 items of plants, cuttings and seeds were received for subsequent growth.

Tropical Department

Tropical Pits

During the year a good deal of work in this section was devoted to the vegetative propagation of many plants from the central section of the Palm House, prior to the renovation work proceeding. A number of the climbers from house No. 10 had also to be dealt with before the

rebuilding of this house. Numerous consignments of seeds, and living plant material, from home and overseas were received during the year. The largest consignment of seeds came from the Kew Herbarium, comprising over ninety packets. A good number of the seeds germinated well and many of the young plants are now growing freely, and should provide valuable additions to the living collections.

Noteworthy plants received were *Amherstia nobilis*, *Amorphophallus titanum*, *Pelargonium zeyheri*, *Diandrolya bicolor*, and several *Begonia* species.

Eighty consignments of plants and plant material were despatched from the Gardens including the following :—

Wardian case of stove and greenhouse plants to the Sydney Botanic Gardens, New South Wales.

Wardian case of ornamental plants, to the Georgetown Botanic Gardens, British Guiana.

Wardian case of stove and greenhouse plants, to the Director, Botanic Gardens, Bermuda.

Collections of cuttings of Anthuriums and Philodendrons to the University of Miami, Florida, U.S.A.

Economic plants

24 Seedling *Bertholletia excelsa*, to the Director of Agriculture, Accra, Gold Coast.

20 Plants of *Cephaelis Ipecacuanha* to the Director of Agriculture, British Honduras.

7 Plants *Agave lechuguilla* to the Director of Agriculture, Mahalapye, Bechuanaland Protectorate, S. Africa.

12 Seedling *Bertholletia excelsa*, to the Principal Agricultural Officer, Buea, British Cameroons.

5 Seedling *Shorea gysbertsiana* to Pamol Ltd., Calabar, N. Nigeria.

Ferneries

In the early part of the summer the Fernery Pit No. 6A was rebuilt in Deal on the original foundations. The roof of the new house was raised and designed to give more light and better growing conditions. Extra light was obtained by reducing the glazing bars, and fitting larger panes of glass.

In late autumn the Ministry of Works were called in to renew some of the main roof timbers in Pit No. 6, which had become badly decayed, When these timbers and roof lights were removed it was found that the whole of the roof timber was infected by fungus, and so had to be stripped and rebuilt. This operation coming so soon after the rebuilding of Pit No. 6A greatly disorganised the work of this section. Many of the young ferns which we have raised from spores, especially those from the Tropics, may suffer a setback in having to be moved from house to house.

It is interesting to record the vast improvement in the growing conditions of the exotic fern collection in the new No. 2 Teak house constructed in 1955. This is due to the additional light and better heating

facilities which were provided. The Epiphytic ferns have established themselves and many genera, e.g. Drynariopsis, Platyceriums, etc., are growing profusely. The valuable fern collection has once again been enriched by material and spores kindly donated by C. D. Adams, Achimota, Gold Coast, J. S. Womersley, Papua, New Guinea, Prof. I. Manton, spores from Assam, Messrs. E. Milne-Redhead and P. Taylor spores from the Tanganyika expedition, N. M. Wace, Gough Island, South Atlantic, and the British Museum (Natural History), spores from S. Rhodesia, Cameroons, Nepal, New Zealand, and St. Helena.

Many new introductions of Fern have been successfully raised from spores, e.g., *Anemia villosa*, *Cheilanthes hispanica*, *Microlepia stenoloba*, *Notholaena marantae*, and *Onychium siliculosum*. Material from many of the plants introduced has been supplied to, and fixed by Professor I. Manton, for cytological examination.

No. 1 *House*

In the early part of the year the centre beds were top dressed and overhauled, a number of the large overgrown specimens of Anthuriums, Dieffenbachias, Calatheas, and Philodendrons, being replaced with younger plants. It was found necessary in late summer to close the middle path of this house to the public, and to use the area to house plants from the centre portion of the Palm House and other large plants from the Tropical pits.

The new aluminium alloy succulent house was almost completed at the end of October after a period of two years. Unfortunately the movement of the metal work on this house has produced a problem for the designers and constructors. The expansion and contraction became so great during the past months that it broke several large panes of glass on the roof and side lights. Owing to these structural complications it has only been possible to use the middle beds to rehouse the large succulent plants, which were stored in the Temperate House, Palm House, Sherman Hoyt House, and House No. 7. Many of the large specimen Agaves which were placed in the Temperate House have suffered from their long stay, owing to the conditions not being suitable for them. The work of overhauling these large plants has been completed, the majority having to be repotted, or re-tubbed before setting them up in the new house. Several of the large specimen Euphorbias and Cereus from the Palm House have been permanently planted out in beds of well prepared soil.

During the year we received valuable donations of succulent plants from H. Hall, Kirstenbosch Botanic Gardens, Mr. and Mrs. Higgins, Croydon, and P. R. Bally, Nairobi. Many of these new plants will be useful for furnishing the side stages of House No. 5.

Orchids

The seasonable display of Orchids in bloom, were well maintained throughout the year in the Orchid Show Houses, in spite of the sunless summer. Orchids such as Cattleyas, Dendrobiums, Cymbidiums, Selenipediums, Zygopetalums, and many others flowered to advantage for long periods. During the year over fifty new Orchid species were added to the collections. These were donated by Messrs. A. D. Thompson, British Guiana, A. H. Schrage, Sumatra, H. W. Simmonds, Fiji,

K. W. J. Keay, Belgian Congo, Lt.-Col. H. Rankin, N.E. Assam, L. Maurice Mason, E. W. B. Milne-Redhead, S. Tanganyika, A. Himson, New Guinea, and Sanders Ltd., St. Albans.

In autumn, owing to the poor condition of the wood-work on the Orchid show houses, the Ministry of Works had to fix roofing felt over the gaps between the ridge plates and roof lights, to keep out rain and prevent loss of heat. Rust and corrosion on the iron framework was chiefly responsible for lifting the roof lights, thereby causing roof leakage, etc.

In late summer, work commenced on the rebuilding of the *Victoria amazonica* house No. 10, and the Insectiverous house 10A. Before starting, substantial partitions had to be erected to maintain the heat in the Economic house, Stove, Nepenthes, Pelargoniums, and Orchid Show Houses. The two new houses are built in Burma Teak, on the original foundations, but designed with less woodwork, improved geared roof ventilators, and larger panes of glass to provide additional winter light. New heating pipes were installed on new bearers under the iron floor gratings. These new houses should be ready for occupation early in the new year.

This is the first time for many years that the " Giant Water Lily " *Victoria amazonica* has not been on show at Kew. Due to the mild and practically fog free weather at the end of the year, the short day flowering plants have been seen at their best. These included such plants as *Jasminum rex*, *Peristrophe speciosa*, *Reinwardtia trigyna*, *Plumbago rosea coccinea*, and the various types of fibrous rooting Begonias. In spite of the lack of fog, a heavy oily soot deposit is to be found on the glasshouses. This deposit has to be washed off at frequent intervals to obtain the maximum amount of winter light.

Palm House

The plants growing in the reconditioned north end of the Palm House showed a marked improvement due to the additional light and better heating facilities provided. The renovation work on the south end of the Palm House went ahead throughout the summer months and was completed at the end of August. During the renovation work the engineers installed new hot water pipes, and valves under the iron gratings in the middle of this section, and also renewed the river water supply pipes and fitted new control valves.

The centre portion was cleared of plants in readiness for the renovation work to proceed in this section. Before this could be done a portion of the partition had to be taken down, to allow the large specimen plants to pass through without damage. The large plants of Cycads were moved through to the south end, so that the Palm collection could be arranged in the north end of the house. The Ministry of Works provided several additional square tubs to house the large plants and Palms permanently planted and in the beds. By the end of September all the smaller plants from the beds and side stages were clear. The builders then commenced to erect their scaffolding on the outer perimeter, whilst the larger specimens in the middle beds were being tubbed. By the end of October the middle section was clear of plants, except for five very large

specimens which could not be moved through to the side compartments owing to their great height and the lack of room. Two of the very tall Palms had to be tubbed and tilted at an angle in the beds to miss the scaffolding overhead. It is interesting to note that all the large plants tubbed the previous year, such as the *Brownea crawfordii*, etc., are all flourishing.

No. 15 *Water Lily House*

Once again this house was one of the chief attractions to the general public. The tropical Water Lilies gave a magnificent display throughout the summer. The various types of Gourds, trained on the roof and flowering climbers, were greatly admired, by home and overseas visitors.

Quarantine House

Throughout the spring and summer months, we continued to propagate the various clones of *Theobroma cacao*, especially Lafi No. 7, which was received last season from Samoa. Cuttings rooted freely and many were ready for despatch by the end of the summer. It was found necessary during the season to reduce a number of the original stock plants of the earlier clones, to make room for the more recent stock plants. Over 240 young plants of the various clones were despatched by air, and sea to the following :—

The Director of Agriculture, West African Research Institute, Tafo, Gold Coast.

The Director of Agriculture, Suva, Fiji.

The Director of Agriculture, Kuala Lumpur, Malaya.

The Director of Imperial College of Tropical Agriculture, Trinidad.

Principal Agricultural Officer, British Cameroons.

In the new Banana Quarantine House which was rebuilt in 1955, work on the propagation and growing on the various types of Musas continued. New stock plants of *Musa* seedling No. 1877 were received from the Director of Agriculture, Jamaica, and plants of *Musa acuminata* var. *robusta*, from The Imperial College of Tropical Agriculture, Trinidad. Suckers have been successfully propagated from the stocks received, and many of these are now well established, and should be ready for despatch next season. The following plants were sent abroad :—

4 Suckers of Musa lacatan to the Director of Agricultural Research, Nigeria.

15 Suckers of Musa Pisang nangha.

1 Sucker of Musa Pisang Rotan, to the Director, Imperial College of Tropical Agriculture, Trinidad.

Alpine and Herbaceous Department

Generally this has been a very bad growing year with many disappointments. The extreme cold experienced in the early spring accompanied by lack of rain, greatly handicapped the germination of annuals and biennials in the natural order beds. It prevented the normal development of many plants in the rock garden, which were therefore

not seen at their best. The continuous rain and very cold nights of the summer and late autumn deprived many of the sun loving plants and especially those with woolly foliage of the warmer growing conditions which they require. Most plants flowered very late in the season and many failed to set and ripen good seed with the result that the seed collection was one of the poorest on record.

The portion of the rock garden at the north end which had been reconstructed the previous year was replanted during the spring and summer with special stocks of plants prepared for this purpose. These made excellent growth and by the late autumn this new work was well covered. An area of the rock garden adjoining the rose walk has of recent years become badly affected with Equisetum. The various experiments carried out to eliminate this, using selective types of weedkiller failed to have any appreciable effect, and the site has now been thoroughly excavated and treated chemically in the hope that the pest will be eliminated. Alterations are being made on the west side of the rock garden facing the orchid houses, this necessitated a clearance of a large Holm Oak, Holly and Yew trees. It was thought desirable to raise this part and over a 100 tons of new soil have been brought in for the purpose.

In the rock garden little artificial watering was needed and it was noted that many plants which normally produce an abundance of seed failed completely or gave only a small amount compared with that usually available. Outstanding plants which flowered well were *Anemone rupicola*, a handsome white flowered species, and *Polygonum emodi* a useful trailing species which hangs over the face of rocks. Both plants were raised from seed collected by Messrs. Stainton, Sykes and Williams on their Nepal expedition in 1954. Others included *Ranunculus gramineus*, a very lovely species of buttercup and the attractive *Vicia canescens* from the Lebanon, with pale lavender blue flowers contrasting well with the silvery foliage. *Erigeron aurantiacus*, an uncommon dwarf species with large orange flowers did well, and also *Epilobium chloraefolium* var. *kaikaurense* which was raised from seeds sent from New Zealand. This plant has very attractive creamy white flowers which are produced freely throughout late summer. These plants wintered well on the rock garden and appear to be frost resistant.

In the Iris garden the provision of a large rectangular bed devoted entirely to species is proving of great interest, and during the year quite a number of new species have been presented to the gardens by Mr. W. Neel. Members of the Iris Society have been very generous in donating to Kew many new varieties of Iris, some of which cannot yet be obtained in the trade. They are being carefully grown on in the nursery and will replace the older varieties in due course. The display in the Iris garden was excellent, and this season owing to cooler conditions the flowers remained good over a longer period than usual. After flowering the plants in four large corner beds which were becoming overcrowded were lifted and replanted and a number of new varieties introduced from the nursery. The surrounding turf was successfully treated with selective weedkiller to reduce daisies and other weeds which were becoming prevalent.

Near the entrance leading from Cumberland Gate, the new planting derived great benefit from the wet season. Between the plants of Rhododendron, Erica, Vaccinium and Enkianthus, etc., a large number of Primulas, Meconopsis and Liliums have been planted, the lilies including many species purchased from the collection of the late Mr. Rose of Southampton. A very fine group of *Lilium parryi* flowered this year, and many of the stems reached 3 ft.–4 ft. in height with 10–14 flowers. Regarded by many as a difficult Lily to grow the group was admired by visitors who were fortunate enough to see the plants in flower. A number of good flowering spikes of Lilies were contributed to the co-operative exhibit of this genus held at the Royal Horticultural Society's Hall in July. The new border of Hosta's and Hemerocallis species recently planted at the base of the mound gave a very attractive display of flowers during the summer. *Hosta elata* received an Award of Merit from the Royal Horticultural Society also *Anthyllis montana* var. *rubra.*, and *Muscari latifolium* and *Iris graeberiana.*

The Alpine house contributed a continuous display of flower from early spring until mid-summer. Early flowering bulbous plants such as Crocus, Narcissus, dwarf Tulips, Muscari, etc., gave their usual colourful display whilst the hardy forms of Cyclamen and species of Saxifraga flowered particularly well. *Primula forrestii* is now becoming very scarce in cultivation and a number of well grown pots of this plant may serve to stimulate interest in its culture.

Among many other interesting plants was a very charming early flowered form of *Iris bakeriana*, *Plagiorhegma dubium* and *Ranjania japonica* both belonging to Berberidaceae, the uncommon *Primula rusbyi*, a dainty dwarf species raised from seed collected in N. Italy by Mr. G. Collins and *Sedum coeruleum.* These are very common species.

The hardy flowering Nymphaeas in the aquatic garden were very disappointing in the summer as the very cold weather and lack of sun failed to enable them to flower freely.

Many interesting plants, bulbs and seeds were received by the department during the year. These included a miscellaneous collection of alpine plants with some Dianthus species collected by Miss Hooper on the French side of the Pyrenees, Mr. O. Polunin who recently made an expedition to Kashmir sent a very varied and interesting lot of seeds. Many interesting bulbous and unusual plants were received from Sir Frederick Stern, whilst Sir Eric Savill of Windsor Great Park, contributed seeds of Primulas, Meconopsis and Lilies. From the Royal Horticultural Society's Gardens, Wisley, a fine collection of Sempervivums and many unusual Alpines not represented in the collection were received. Edinburgh Botanic Gardens made their usual contribution of both seeds and plants which we required and Mr. W. E. Gray sent living material of Alpines collected by him in Andorra, Spain. The North American Lily Society sent a fine collection of Liliums and through the kindness of Miss M. Stone a number of interesting Alpines were obtained from her extensive tour of Mont Cenis and the vicinity north of the Maritime Alps.

New works were limited during the year and consisted chiefly of the construction of some 30 ft. of unheated span frames, several new large

storage bins, the re-roofing of the offices, potting sheds and workshop adjoining Museum 2. In addition the Alpine house and a number of propagating frames were repainted during the summer.

Many new plants were added to the natural order beds and these now tend to be overcrowded and it will be difficult to find room for further additions. *Inula magnifica*, a native of the Caucasus, flowered extremely well and also *Liatris spicata* and *Coreopsis verticillata*, all obviously suited by the wet summer.

Over 6,000 packets of Alpine and herbaceous seeds were sent out during the year to various botanical and horticultural institutions throughout the world, the highest total recorded since the war. A considerable quantity of living plant material was also despatched to scientific and other establishments.

Publications

W. B. Turrill : Flora of Tropical East Africa, *Caryophyllaceae* pp. 1–38. (1956).

N. L. Bor : Notes on Asiatic Grasses : XXV. A Himalayan *Trisetum*, in Kew Bull. 1956, 212. Ditto : XXVI. New Species, in Kew Bull. 1956, 255–258.

F. Ballard : Pacific Ferns described in Nightingale's Oceanic Sketches, in Pacific Science **20,** 268–270 (1956).

R. A. Blakelock : Notes on the Flora of 'Iraq with Keys—Part II in Kew Bull., 1955 : 497–565. Notes on African *Celastraceae* : I, in Kew Bull. 1956, 237–247.

J. P. M. Brenan : A new section of the genus *Chenopodium* from Africa, in Kew Bull. 1956, 165–7. The genus *Cola* in Kenya, Uganda, and Tanganyika, in Kew Bull. 1956, 141–152. *Buforrestia imperforata* C. B. Cl. var. *glabrisepala* (De Wild.) Brenan in Troupin, Fl. Spermat. Parc. Nat. Garamba, 160 (1956). *Murdannia stricta* Brenan in Troupin, op. cit. 171–3 (1956). Notes on *Mimosoideae* : II, in Kew Bull. 1956, 185–205.

E. A. Bruce : Notes on African *Strychnos* : III, in Kew Bull. 1955, 627–629. (1956). Notes on African *Strychnos* : IV, in Kew Bull. 1956, 153–158. Notes on some tropical African species of *Mostuea* Didr., in Kew Bull. 1956, 159–160.

E. A. Bruce and J. Lewis : Notes on African *Strychnos* : V, in Kew Bull. 1956, 267–275.

A. A. Bullock : Notes on African *Asclepiadaceae* : VII, in Kew Bull. 1955, 611–626.

R. W. G. Dennis : Two species of *Helotiaceae* with gelatinised surface tissues, in Kew Bull. 1955, 567–569, 1956 ; A *Taphrina* on ferns in Scotland, in Notes from the Royal Botanic Garden, Edinburgh **22,**

130, 1956 ; A revision of the British *Helotiaceae* in the Herbarium of the Royal Botanic Gardens, Kew, with notes on related European species. Commonwealth Mycological Institute Mycological Paper 62, 216 pp., April 1956.

R. W. G. Dennis and E. A. Ellis : The ergot on *Eleocharis* in Norfolk, in Trans. Norfolk and Norwich Nat. Soc. **18,** pp. 18–20, 1956.

J. Elffers : Note on *Caylusea abyssinica*, in Kew Bull. 1955, 630 (1956).

L. L. Forman : *Menispermaceae* of Malaysia. I. (*Stephania*) in Kew Bull. 1956, 41–69 (with 8 maps).

J. B. Gillett : *Indigofera*—New species, varieties and names from West Tropical Africa, in Kew Bull. 1955, 573–586 (1956).

R. A. Graham : African *Polygonaceae*, in Kew Bull. 1956, 254. A new form of *Polygonum senegalensis* Meisn., in Kew Bull. 1956, 256.

J. H. Hemsley : Flora of Tropical East Africa, *Connaraceae* (1956).

F. N. Hepper : A new species of *Cnestis* (*Connaraceae*) from West Tropical Africa, in Kew Bull. 1956, 122. New Taxa of *Papilionaceae* from West Tropical Africa, in Kew Bull. 1956, 113.

F. N. Howes : History and Development of the Cultivated Fruits (Part IX), in Assoc. Agric. Review, No. 30, 8–18 (1956).

R. W. J. Keay : A new species of *Cassia* Linn. from West Africa, Bull. I.F.A.N. sér. A, 18, pp. 375–376 (1956). New taxa and combinations for the " Flora of West Tropical Africa "—I : *Linaceae*, *Euphorbiaceae*, *Icacinaceae*, *Santalaceae*, *Rutaceae*, *Meliaceae* ; II : *Sapindaceae*, *Anacardiaceae*, Bull. Jard. Bot. Brux. 26, pp. 183–209 (1956). African Vegetation : Yangambi Meeting, *Nature* 178, No. 4545, pp. 1273–1274 (1956).

J. Lewis : Flora of Tropical East Africa, *Rhizophoraceae* (1956).

R. Melville : An early specimen of *Ulmus carpinifolia* Gleditsch. Kew Bull. 1956, 179–181. Contributions to the flora of Australia : III. The *Ranunculus sessiliflorus* complex in Australia, in Kew Bull., 1956, 277–286. Inheritance of acquired characters, in Nature, 178, 1210–1211 (1956).

Metcalfe, C. R. Papillae and fluted veins on the abaxial leaf surface of *Stephania zippeliana* Miq. (*Menispermaceae*), in Kew Bull. 1956, 71–72. The taxonomic affinities of *Sphenostemon* in the light of the anatomy of its stem and leaf, in Kew Bull. 1956, 249–53.

E. Milne-Redhead : *Mikaniopsis*, in A. W. Exell, Suppl. Cat. Vasc. Pl. S. Tomé 27 (1956).

E. Nelmes : Notes on *Cyperaceae* : XXXIX. African species of *Scleria* excluding Sect. *Hypoporum*, in Kew Bull. 1956, 71–111. Ditto : XL. A new Malaysian *Carex*, in Kew Bull. 1956, 182.

D. A. Reid : New or interesting records of Australasian Basidiomycetes, in Kew Bull. 1955, pp. 631–648, 1956.

D. A. Reid and S. S. Hooper : *Ustilago violacea* (Pers.) Fuckel on a hybrid *Dianthus* from South Africa, in Kew Bull. 1956, 163.

N. Y. Sandwith : Contributions to the Flora of Tropical America, LXI–LXII, in Kew Bull. 1956, 289–293 (1956) ; 1956, 294–296 (1956). The identity of *Oxalis primulaefolia* Raddi, in Webbia, 12, 331 333 (1956).

J. R. Sealy : The Roxburgh Flora Indica Drawings at Kew (Part 1), in Kew Bull. 1956, p. 297–348 ; Review of the Species of Camellia, in American Camellia Yearbook, 1956, p. 1–9 ; A New species of Camellia from Hong Kong New Territory, in Journ. R.H.S. 71, 181–3 (1956); A New Hybrid *Aesculus*, ibid. 420–3 (1956); *Camellia*, *Hymenocallis* and *Nerine*, in R.H.S. Dictionary of Gardening Supplement (1956).

V. S. Summerhayes : Notes on Asiatic Orchids : 1, in Kew Bull. 1955, 587–589 (1956). African Orchids : XXIII, in Kew Bull. 1956, 217–236.

ROYAL BOTANIC GARDENS, KEW
SCIENTIFIC AND ADMINISTRATIVE STAFF.

31st December, 1956.

Director

George Taylor, D.Sc., F.R.S.E., F.L.S., V.M.H.

Assistant Director

N. L. Bor, C.I.E., M.A., D.Sc., F.L.S.

HEAD OFFICE

Establishment Officer—Vacant.

Clerical Officer/Secretary—Mrs. A. M. E. Kendall.

Clerks—Mrs. L. A. Kell.
Miss C. M. Newall.

Telephone Operator—Miss R. Duffield.

HERBARIUM AND LIBRARY

Keeper (S.P.S.O.)—W. B. Turrill, O.B.E., D.Sc., F.L.S., V.M.H.

Senior Principal Scientific Officer— C. E. Hubbard, O.B.E., F.L.S.

Principal Scientific Officers—V. S. Summerhayes, B.Sc.
F. Ballard, B.Sc.
N. Y. Sandwith, M.A., F.L.S., F.R.G.S.
E. Milne-Redhead, T.D., M.A., F.L.S.
R. Melville, B.Sc., Ph.D., F.L.S.
R. W. G. Dennis, B.Sc., Ph.D.
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NOTES ON AFRICAN CELASTRACEAE : III.*

R. A. Blakelock

Maytenus mossambicensis (*Klotzsch*) *Blakelock* comb. nov.

Shrub sometimes climbing or a small tree. Twigs slender sometimes pubescent. Leaves membranous, not glaucous when dry, without resinous threads, 0·4–3 sometimes 7·6 cm. long. Inflorescence a pedunculate divaricate cyme, inflorescence branches slender. Petals 1–2·5 cm. long. Aril an oblique cup covering basal quarter or covering entire seed.

var. **mossambicensis**

Celastrus mossambicensis Klotzsch in Peter's Mossamb. Bot. 112 (1861).

Gymnosporia harveyana Loes. in Bull. Herb. Boiss. **4,** 430 (1896).

Celastrus concinnus N. E. Brown in Kew Bull. 16 (1906).

Glabrous in all parts seen.

Tanganyika. Between Zanzibar and Uyui, 1886, *W. E. Taylor* (BM) ; T3, Kangeta, Handeni District, Sept. 1953, *Watkins* 646 (EA ; K) ; T6, Rupia, c. 400 m., 16.6.1932, *H. J. Schlieben* 2412 (BM) ; T6, Manyangu forest, Turiani, Morogoro District, Nov. 1953, *Semsei* 1404 (EA ; K) ; T7, Njombe District, about 14·5 km. S. of Njombe, poor upland rain forest, 1860 m., 5.7.1956, *E. Milne-Redhead & P. Taylor* 10958 ; T8, Lindi District, Sudi, *Gillman* 1470 (EA ; K) ; T8, 160 km. W. of Lindi, 450 m., 22.4.1945, *H. J. Schlieben* 6365 (BM) ; T8, Songea District, Gumbiro, in abandoned cultivation in *Brachystegia* woodland on sand, 2900 m., 24.1.1956, *E. Milne-Redhead & P. Taylor* 8413 ; T8, Songea District, about 2 km. W. of Johannsbruck in *Brachystegia–Uapaca* woodland, 960 m., 18.4.1956, *do.* 9758 ; T8, Songea District, Kitai in *Brachystegia–Uapaca* woodland towards R. Rovuma, 880 m., 17.4.1956, *do.* 9758A.

S. Rhodesia. Gazaland, Chirinda outskirts, 3700–4000 ft., Oct. 1905, *C. F. M. Swynnerton* 118 (BM ; K) ; Gazaland, Chikore Hills, 3500 ft., 22.4.1905, *do.* 185 (BM ; K) ; Gazaland, Umtereni Hill, 4000 ft., 1.10.1906, *do.* 1127 (BM) ; Gazaland, Chipet--zana River, 3000 ft., 19.4.1907, *do.* (BM) ; Umtali, Oct. 1927, *Steedman* 5145 ; Lundi Drift, July 1929, *J. C. Smuts* ; Lundi River, 30.6.1930, *J. Hutchinson and J. B. Gillett* 3248 ; Vumba Mts., March 1942, *Ferrar* 4092 ; Pungwe River District, Inyanga, 6000 ft., *H. Wild* 1480 ; Chirinda District, Chipete Forest, 3800 ft., 22.10.1947, *H. Wild* 2130 ; Mellsetter District, Farm Fairview, 6300 ft., 15.11.1950, *Crook* 282 ; Umtali District, Himalayas, Banti North, 6500 ft., 4.3.1954, *H. Wild* 4516.

Portuguese East Africa. Rovuma River, 28.3.1861, *Kirk* ; Rovuma River, 28 miles from coast, 15.3.1861, *Meller*.

S. Africa. Natal, *Gerrard* 285 ; Natal, Lidgetton, 3–4,000 ft., 6.11.1896, *Wood* (syntype of *C. concinnus* N. E. Brown) ; Natal, Inanda, *Wood* 1395 (syntype of *C. concinnus* N. E. Brown) ; Zululand, Indeni Forest, 27–28.11.1899, *Wood* 7896 ; Kentani District, Jan. 1909, *Pegler* 298 ; Transvaal, Zoutpansberg, Dec. 1909, *Worsdell* ; Natal, Alexandra District, Dumisa, 600 m., 1100 m., 1.10 and 14.12.1911, *Rudatis* 1164, 1559 (BM ; K) ; N.Transvaal, near Tzaneen, June 1916, *F. A. Rogers* 18842 ; Swaziland, Hlatikulu, 22.10. 1929, *Galpin* 9644 ; N. Transvaal, Zoutpansberg, Entabeni, 4000 ft., 19.7.1930, *J. Hutchinson and J. B. Gillett* 4216 ; same loc., Nov. 1931, *Obermeyer* 30059 ; same loc., 10.9.1947, *Codd* 3059 ; Transvaal, Kruger National Park, 6 m. N.W. of Punda Maria, 1500 ft., 18.4.1950, *E. A. Bruce* 174 ; Transvaal, Zoutpansberg, Mutall River, 18½ m. N.E. of Sibasa, 1900 ft., 22.2.1952, *Codd* 6932 ; Transvaal, Kruger National Park, Punda Maria, 19.2. and 24.5.1954, *Schyff* 3780 ; Transvaal, Sebasa, 20 miles from Sebasa on Witulag road, 16.11.1954, *Meeuse* 9388.

The type-specimen was : Portuguese East Africa, Ihambane and Lourenço-Marques, Delagoa Bay, 23°–26° S., *Peters*. This has not been seen. The original description of *Celastrus mossambicensis* includes the phrase " fruticosus ramosus glaber ", so the glabrous variety must be regarded as the typical one, although the pubescent var. *ruber* is commoner in Tropical East Africa.

In var. *mossambicensis* the petals are white in all specimens where the flower-colour is recorded except *Milne-Redhead and P. Taylor* 10958

*Continued from Kew Bull. 1956 : 555–557 (1957).

where the petals are creamy white tinged pink outside ; it is not mentioned in the original description.

Milne-Redhead's and P. Taylor's field-notes supply further information on this variety—a small shrub 0·5–3 m. tall, much branched above, stems arching or erect from a woody underground rootstock ; bark pale-brown or red-brown ; leaves pale green or pale greyish green above slightly paler below, margin sometimes reddish ; inflorescence branches reddish or pale green tinged red, pedicels sometimes creamy ; calyx red or pale green tinged with red or pink ; petals white, creamy, or creamy white tinged pink outside ; filaments creamy or white ; anthers green tinged red or dull yellow ; disc pale green, pale yellow-green or flesh-coloured ; ovary pale green, pale yellow green or creamy ; style pale green, creamy or whitish above pink below ; fruits green or greenish-white ripening to cherry red ; seeds covered with an orange aril.

In some S. Rhodesian material (*Swynnerton* 118, *Wild* 1480, *Crook* 282) there are 6–7 sepals with more dentate margins than is usual in the species.

Var. *mossambicensis* is very close to the small-flowered specimens of *M. senegalensis* (Lam.) Exell.

var. **ruber** (*Harvey*) *Blakelock* stat. nov.

Celastrus ruber Harvey ex Harvey et Sond. Fl. Cap. **2,** 592 (1862).

Gymnosporia gracilis Loes. l.c. **17,** 545 (1893).

G. ambonensis Loes. l.c. **19,** 231 (1894).

G. rubra (Harv.) Loes. in Bull. Herb. Boiss. **4,** 430 (1896).

G. zanzibarica Loes. in Engl. Bot. Jahrb. **41,** 304 (1908).

Twigs ± pubescent. Lower surface of leaves, peduncles, pedicels, and outer surface of sepals glabrous or pubescent.

Kenya. K7, N. of Mombasa to Lamu and Witu, 1902, *A. Whyte* (BM) ; K7, Arabuko, *R. M. Graham* 1990 (EA ; K) ; K7, Arabuko, Sept. 1930, *G. H. Donald* 77 ; K7, Arabuko-Sokoke, 1932, *McNaughton* 9238 ; K7, Arabuko near Malindi, Aug. 1936, *Dale* 3546 (EA ; K) ; K7, Sokoke, Sept. 1936, *B. & C. F. M. Swynnerton* K38 ; K7, Fumbuni, near Kilifi, 11.9.1936, *C. F. M. Swynnerton* 111 ; K7, Kilifi, 200 ft., 30.7.1937, *J. Y. Moggridge* 437 (EA ; K) ; same loc. 20.7.1937, *J. Y. Moggridge* 379 (EA) ; K7, Kisigau, 4600 ft., Sept.–Oct. 1938, *Joanna* 8868 ; K7, Milimani, Boni forest, 300 ft., *Mrs. J. Adamson* 5834 ; K7, Makadara, Shimba Hills, 1000 ft., July 1939, *C. G. van Someren* 11247 ; K7, near Marenge Forest, Lungalunga–Msambweni Road, c. 50 m., 18.8.1953, *Drummond and Hemsley* 3847 ; K7, Kilifi, Sokoke, *Gisau* 89.

Tanganyika. T3, Usambara, Mascheua [Mashewa], July 1893, *Holst* 3575 (isotype of *G. ambonensis* Loes., K) ; T3, Tanga, Kwamarimbo, Ngomeni, 3.6.1908, *Braun* 1793 (EA) ; without loc., *Holtz* 7241 (EA) ; T3, Tanga District, Mtimbwani, 50 ft., 6.12.1935, *Greenway* 4204 (EA ; K) ; T3, Kiberoshi, Aug. 1940, *Mr. and Mrs. Hornby* 2013 (EA ; K) ; T3, Pangani District, Bushiri Estate, 6.8.1950, *H. G. Faulkner* 669 ; T3, N.W. Shume forest, 4 km. N.E. of Kwemandala, W. Usambaras, 1900 m., 2.3.1953, *Drummond and Hemsley* 1394 ; T3, Lushoto District, 1 mile E. of Mashewa, 500 m., 29.6.1953, *do.* 3098 ; T3, Tanga District, Ngomeni, 150 m., 28.7.1953, *do.* 3495 ; T3, Tanga District, 4 miles S.E. of Ngomeni, 75 m., 2.8.1953, *do.* 3605 ; T6, Dar-es-Salaam, 1.11.1869, *Kirk* 138 ; T6, Mafia Is., Kirongwe, c. 25 ft., 6.8.1937, *Greenway* 5007 (EA ; K) ; T6, Mafia Is., c. 30 ft., 10.10.1937, *Greenway* 5344 (EA ; K) ; T6, Morogoro District, Uluguru Mt. above Morningside, June 1953, *Paulo* 77 (EA ; K) ; T6, Kisarawe District, Mogo Forest Resesrve, Aug. 1953, *Paulo* 104 ; T6, Dar es Salaam, Aug. 1953, *Semsei* 1283 (EA ; K).

Zanzibar. Charawe " Bush ", 14.9.1930, *J. H. Vaughan* 1537 (EA ; K).

South Africa. Natal, *Gerard* 54 (isotype of *Celastrus ruber* Harvey BM ; K) ; Zululand, Entumeni, 12.4.1888, *Wood* 3963.

The petals are described as white or greenish-cream in all the specimens above where the point has been noted except for the two S. African specimens (*Gerard* 54, *Wood* 3963) where they are red or rosy. In their other characters these two agree with the other specimens cited.

There is considerable variation in the density of the indumentum, even among specimens from the same Province, for example *Drummond and Hemsley* 1394 is less densely covered than *Drummond and Hemsley* 3098.

Drummond and Hemsley's field-notes describe this variety as a shrub 3–4 m. tall, 4 m. diam. across the shrub ; stem with brown hairs ; pedicels pale-green ; calyx green or dark green ; petals white, cream or greenish cream ; filaments white ; anthers buff ; disc and ovary dark green ; ripe fruit pinkish red or bright red.

Hippocratea plumbea *Blakelock et Wilczek* sp. nov.

A *H. volkensii* Loes. ramulis subteretibus (nec 4-lineatis), petiolis longioribus (7–17 mm. nec 3–7 longis), inflorescentiae ramis sepalis petalis pubescenti-tomentosis (nec glabris vel glabrescentibus), disco convexo (nec cupuliformi).

Frutex scandens, glaber (inflorescentiis floribusque exceptis). *Ramuli* subteretes glabri, laeves, interdum in sicco longitudinaliter irregulariter striati, pubescenti-tomentosi. *Folia* opposita, membranacea, elliptica vel late elliptica, atrocinerea vel nigricantia in sicco, sine filamentis resinosis in foliis fractis, apice acuminata, acumine acuto vel obtuso, margine leviter serrato-crenata vel subintegra, basi rotundata vel cuneata nervis utrinque reticulatis et prominentibus, 3·4–15 cm. longa, 1·9–7·5 cm. lata ; petioli 7–17 mm. longi. *Inflorescentia* axillaris vel terminalis, 1 per axillam, multiflora, saepissime cyma axe centrali praedita interdum cyma divaricata, 1·5–23·5 cm. longa ; bracteae minutae ± triangulares, pubescenti-tomentosae. *Alabastra* globosa apice rotunda. *Sepala* 5, inaequalia, concava, suborbiculata, atrovenosa vel atromaculata, utrinque minute pubescentia, margine minute irregulariter dentata vel fimbriata, apice rotundata, 0·5–0·75 mm. longa, 0·5–0·75 mm. lata. *Petala* 5, concava, membranacea, orbiculato-obovata, atrovenosa venis ramosis, margine breviter fimbriata, apice rotundata, 1–1·5 mm. longa, 1–1·5 mm. lata. *Discus* ± pentagonus, convexus, ater vel atromaculatus, c. 1 mm. diam. *Stamina* 3. *Filamenta* complanata, trapezoideo-orbiculata, minutissime pubescentia, atromaculata. *Antherae* transverse dehiscentes, usque 0·5 mm. latae. *Stylus* subconicus, usque 0·5 mm. longus. *Stigma* quam stylus vix latius. *Ovarium* atromaculatum. *Ovula* 5–8 pro loculo. *Mericarpia* complanata, oblonga, apice basique rotundata, striata, glabra, margine modice arguta, c.7 cm. longa, 2·4–3 cm. lata. *Semina* glabra, c. 12 mm. longa, c. 6 mm. lata, ala c. 16 mm. longa. *Pollen* simplex, granulis triangularibus.

Belgian Congo. Forestier Central, Avakubi, forêts, aux bords de l'Ituri, liane à fleurs vertes, Jan. 1914, *Bequaert* 1903 (holotype, BR) ; District du Ubangi-Uele, La Kulu, brousse, liane, June 1931, *Vanden Brande* 636 (BR).

Uganda. U3, Forest near Mbarafa, Jinja Road, 4000 ft., *Dummer* 3294 ; U4, N.E. of Masindi, forest undergrowth collected in high forest, June 1932, *C. M. Harris* 831 ; U2, Sonso River, Budongo Forest, climber in forest, climbs high, flowers green, Apr. 1933, *W. J. Eggeling* 1297.

In some specimens (*Eggeling* 1297, *Harris* 831) it is difficult to say if there is a long terminal inflorescence or a twig bearing axillary inflorescences from which the leaves have fallen. Fruit has only been seen on *Bequaert* 1903.

I am indebted to Dr. R. Wilzcek for the opportunity to examine the Brussels material of this species. We had both arrived independently at the conclusion that this *Hippocratea* was a new species.

Viability and Storage of Seeds.*—In spite of the importance of seed storage and germination, both in agriculture and horticulture, it is a subject concerning which there is still much to be learned, and the author of the booklet under review has performed a valuable service in summarizing our present knowledge of these topics. Attention is directed especially to aspects of seed germination and storage that have been studied scientifically in recent years. The booklet has been written mainly to provide a background of established fact against which the geneticist or seed merchant can decide what conditions are likely to be the most suitable for any particular kinds of seeds with which he may have to deal. No practical directions are given, but the information in the booklet should enable practical techniques to be devised to suit individual requirements.

It is well known that temperature, relative humidity, the moisture content of seeds and the hardness of seed coats are all important in controlling storage and germination, and a discussion of influences such as these forms the main body of the text. In addition the effects of fungicides, insecticides and herbicides on germination are also dealt with, and there is an important chapter on the genetical aspects of seed storage by T. Ashton in which such topics as mutations in stored seeds are considered. The text is followed by an 11 page appendix in tabular form under the title " Viability of seeds after storage for different periods under different conditions ".

Since the seeds of different kinds of plants vary very considerably in their requirements for optimum germination, there are but few universal principles on the subject that can be laid down. This means that the subject matter of a digest, such as the one under review, must inevitably be presented to the reader in the form of numerous detached pieces of information that cannot readily be welded into a connected whole. For this reason the text, valuable as it is for reference purposes, makes somewhat arid reading, but it is difficult to see how the author could have avoided this. There is an extensive bibliography, but reference to the reviewer's own card index indicates that whilst the author has made a number of important omissions, a few references of very minor significance have been included. Notable omissions are Tincker's review of the subject presented to the Linnean Society in 1942 and the discussion which followed it (Proc. Linn. Soc. Lond. 154th session, 167–84 ; 1942), and the useful article by J. H. Turner in this journal. (Kew Bull. 257–68 ; 1933). The booklet, which will doubtless be useful to all who are in any way concerned with seeds and their germination, ends with an index to subjects and plant species.

C. R. Metcalfe.

* Owen, E. Biasutti. The Storage of Seeds for the Maintenance of Viability ; with a chapter on the genetical aspects of seed storage by T. Ashton. Bulletin 43 ; pp. v + 81, 1956. Commonwealth Bureau of Pastures and Field Crops, Hurley, Berks. 20/- net.

THE SCALES OF CYATHEACEAE.
(with special reference to the genus Schizocaena J. Sm.).

R. E. Holttum

Apart from the genera *Lophosoria* and *Amphidesmia*, which are clearly distinct and should probably not be included in the same family as *Cyathea*, the family Cyatheaceae, as presented in Copeland's *Genera Filicum*, is a very natural one. It consists of a very large number of species, many of them of limited distribution, throughout the wetter parts of the tropics and subtropics (especially on mountains where there is more open vegetation), and into temperate regions in the southern hemisphere. Early proposals to divide the family into genera on the basis of soral structure, the position of sori on the veins, and on venation, were certainly unsatisfactory, leading to separation of species which, as judged by the sum of other characters, are closely allied, and associating unlike species.

Copeland suggests that " the three great geographic groups of species are essentially natural " (p. 96), though on the next page he admits the possibility that *Cyathea* (sens. lat.) " includes groups evolved as distinct long enough ago to be represented in the Orient and also in America ". It has so far proved impossible to define clearly such main geographic groups in morphological terms, but Copeland thought he could recognize four minor groups which could be so defined. I have little acquaintance with the two groups from tropical America (Trichopteris and Cnemidaria) ; but I have studied several species of the two Malaysian groups *Gymnosphaera* and *Schizocaena*, in the field, in cultivation, and in herbaria.

As a result of this study, it is my opinion that the Malaysian species of Cyatheaceae can be clearly divided into two distinct groups, but they are not the groups proposed by Copeland. I further consider that the group of species including the type of the genus *Schizocaena* J. Sm. has an earlier name, and should (if recognized as a genus) be called *Sphaeropteris* Bernh. ; but I am unable to suggest any clearly defined morphological distinction whereby a Malaysian genus typified by *Gymnosphaera glabra* Bl. can be separated from the great bulk of species retained by Copeland in a comprehensive genus Cyathea.

Copeland's key to the genera of Cyatheaceae is unsatisfactory, as he places Schizocaena under the heading " Indusium present ", whereas in the generic description he admits that the indusium may sometimes be " obsolescent or obsolete ". *Gymnosphaera* comes under the heading " axes dark and polished ", whereas in the generic description we read " axes black or sometimes brown, commonly polished ". In order to understand Copeland's intentions as regards generic limits, one must go to the generic descriptions and the lists of species.

The first generic character which might give a distinction concerns the scales. Those of *Gymnosphaera* are described simply as " castaneous ", those of *Schizocaena* as " firm, brown ". This is not a clear distinction. But a comparison of the scales of the type species *Gymnosphaera glabra* and *Schizocaena brunonis* shows a very striking difference, which will be described in the present paper. I have examined the scales of several other

species included by Copeland under the two genera, and find that all of them agree closely with one type species or the other ; but if one groups the species according to scale-character, the groups do not correspond with Copeland's genera.

Species listed by Copeland under *Gymnosphaera*, groups 1 and 2, have all the same scale-type as *G. glabra* ; but the species of group 3, except *G. kingii* (a species native in the Malay Peninsula, certainly belonging to group 2) all have the scale-type of *S. brunonis*. The species *Schizocaena sinuata* and *S hookeri* (native of Ceylon, seen by me in cultivation at Kew) have the scale-type of *Gymnosphaera glabra*, not of *S. brunonis*. The other species listed under *Schizocaena* all agree with the type species in their scales.

The question then arises whether there are any other clearly definable characters which would indicate Copeland's grouping of the species rather than the grouping indicated very clearly by the scales. I can see no such characters, and will next discuss those given by Copeland.

Frond-form. *Gymnosphaera* : " fronds typically bipinnate, rarely simply pinnate or tripinnate ". *Schizocaena* : " fronds simply pinnate, with functionally or vestigially articulate pinnae, or simple ". This is not a very sharp distinction, and it may be noted that the pinnae of *Schizocaena hookeri* are not even vestigially articulate, whereas some species in *Gymnosphaera* group 3 certainly have functionally articulate pinnules, and apparently articulate pinnae (e.g., *Cyathea obscura* (Scort.) Copel., a very close ally of *Gymnosphaera squamulata* Bl.). In the species *Cyathea sarawakensis* Hk. (not mentioned by Copeland but certainly allied to the species of *Gymnosphaera* group 3) both pinnae and pinnules are certainly articulated. *C. alternans* (Wall.) Pr. (also not mentioned by Copeland) is so near *C. sarawakensis* that Christensen (*Index Filicum*) united them. *C. alternans* in the Malay Peninsula usually has deeply pinnatifid pinnae ; in the largest fronds the lowest pinna-lobes are sometimes separate as distinct pinnules. *C. sarawakensis* and *C. alternans* form a complete bridge between the species of Copeland's *Gymnosphaera* group 3 and the type species of *Schizocaena*.

Colour of Axes. *Gymnosphaera* : " axes black or sometimes brown, commonly polished ". *Schizocaena* : " axes brown ". There is in fact no difference at all between the colour of the stipes of species of *Gymnosphaera* group 3 (apart from *G. Kingii*, which does not belong there) and those of *Schizocaena brunonis*. But the stipes of *S. sinuata* and *S. hookeri* are almost black, not unlike those of the *Gymnosphaera* species with which they agree in scales.

Venation. Copeland indicates no difference between the genera.

Sori. *Gymnosphaera* : " sori . . . dorsal on the veins, exindusiate, variously paraphysate ". *Schizocaena* : " sori dorsal on the veins, indusium globose, splitting into large expanded fragments, sometimes obsolescent or obsolete . . . paraphyses filamentous ". *Cyathea sarawakensis* and *C. alternans*, which bridge the gap in leaf-form between *S. brunonis* and the species in *Gymnosphaera* group 3, have indusia. It is not clear from Copeland's treatment where he would place these species. If he places them in *Schizocaena*, the definition of that genus on leaf-form breaks down ; if he does not, the separation of *Schizocaena* and *Gymnosphaera* on presence or absence of an indusium breaks down. I do not think that paraphyses give any clear indication of generic limits in the present case. As regards sporangia, Copeland indicates no difference between the genera.

Thus there is no clear morphological distinction, or group of distinctions, of any kind specified by Copeland, that would support the particular generic grouping he adopts. The distinction of presence or absence of an indusium is not a sharp one, as admitted by Copeland himself in his generic description of *Schizocaena*. The character of articulation of pinnae does not support Copeland's grouping, but does support a distinction based on scales. The character of very dark-coloured stipes is not one that is easy to define, but again it does broadly agree with a grouping based on scales, not on Copeland's grouping.

Scale-characters

The scales of *Schizocaena brunonis* are rather thin and quite pale (sometimes becoming more or less brown with age). A hand-lens shows them to have short oblique dark marginal setae, the remaining cells of the scale apparently uniform in character. A microscope confirms this uniformity, and shows that all cells are more or less elongate in the same direction as the length of the scale, and all have slightly thickened lateral walls, which are irregularly pitted ; the superficial walls are thin. The obliquely projecting marginal cells are much darker in colour than the other cells, and have much thicker walls, which are only pitted where they are in contact with other cells (fig. 1).

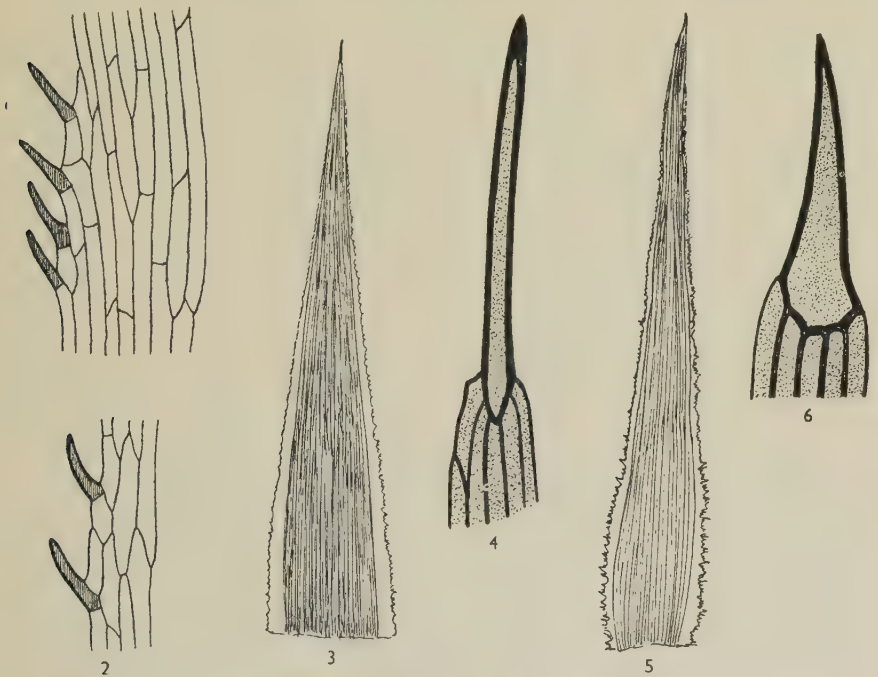


Fig. 1. *Schizocaena brunonis*, part of edge of scale, × 80. Fig. 2. *Cyathea medullaris*, part of edge of scale, × 80. Fig. 3. *Gymnosphaera glabra*, a complete scale (broken off at base), × 4. Fig. 4. Tip of scale shown in fig. 3, × 80. Fig. 5. *Cyathea latebrosa*, a complete scale, × 16. Fig. 6. Tip of scale shown in fig. 5, × 200.

The scales of *Gymnosphaera glabra*, and of other species included by Copeland in the first two groups of the genus, are composed mainly of elongate very dark-coloured cells with rather thick lateral walls, but on each side of the scale is a band of pale thin-walled cells, not elongate in the direction of the length of the scale (fig. 3). The apex of the scale is a single long thick-walled cell (fig. 4). In general, the pattern of the marginal cells is to spread outwards in a fan-like manner, for which reason DeWolf has proposed the adjective *flabelloid* for this type of scale (in unpublished M.Sc. thesis, University of Malaya). DeWolf investigated scales of several species of the two groups, and also of *Cyathea latebrosa* (Wall.) Copel. (a species left in Cyathea by Copeland), the latter from fresh material of plants growing in Singapore. He also examined scales, from herbarium specimens from various sources, of species of Cyatheaceae

from other parts of the world. His observations show that scales in Cyatheaceae can be divided clearly into two types, one being that of *Gymnosphaera glabra* (flabelloid), the other that of *Schizocaena brunonis* (setiferous).

The marginal band of thin cells of scales of the flabelloid type is usually more or less damaged in dried herbarium specimens, and it is difficult to see the microscopic details of the actual edges clearly. The only species of which I have examined intact and quite fresh scales is *Cyathea latebrosa*, which is not one of the group of *Gymnosphaera glabra*. When I first saw scales of this species (which is common in Singapore), examining them on old fronds with a hand lens, I thought they had no marginal band of thin-walled cells ; the band is very fragile, and almost worn away from old scales. DeWolf, however, examining scales from the inner parts of the coils of young unexpanded fronds, found that the flabelloid band of thin-walled cells is quite well developed. The margins of this band are more or less deeply lacerate, the lobes ending irregularly in single very delicate cells, which shrivel as soon as they come into contact with dry air. Fig. 8 is a drawing made from a scale from a plant (origin Singapore) now in cultivation in the Royal Botanic Gardens, Kew. Nuclei and small plastids could be seen in the thin-walled cells, which were still living. Figs. 5 and 6 show a complete scale and its apex.

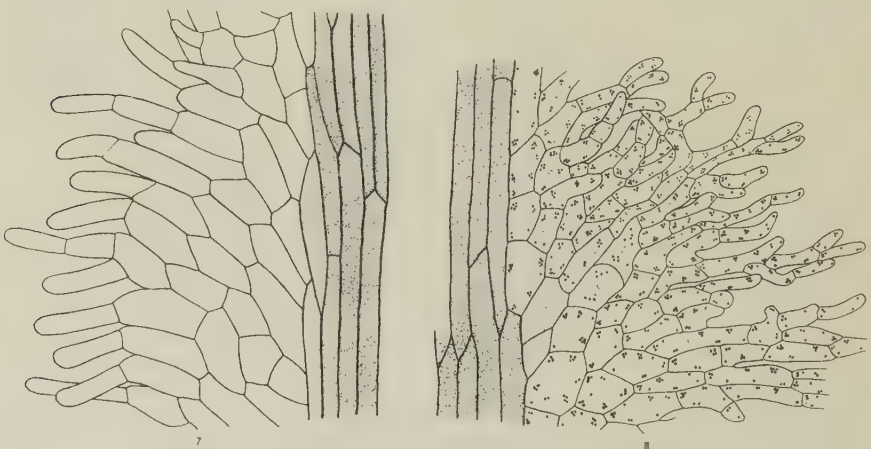


Fig. 7. Part of edge of scale from herbarium specimen of *Gymnosphaera glabra*, × 140.
Fig. 8. Part of edge of scale from living plant of *Cyathea latebrosa*, × 140.

The edges of scales of *Gymnosphaera glabra* are lacerate in much the same way as those of *Cyathea latebrosa*, but are more robust, so that the arrangement of the marginal cells can sometimes be seen fairly clearly in herbarium specimens. Fig. 7 is a slightly reconstructed drawing made from a scale from a specimen of *G. glabra* from Thailand (E. Smith no. 772). I can see no basic difference in structure between the scales of *G. glabra* and *C. latebrosa*.

DeWolf showed that in stipe-scales of *C. latebrosa* there are sometimes thick-walled unicellular hairs, in character like the single apical cell which terminates the central band (but more slender), borne superficially or marginally by thin-walled cells of the lateral bands. This observation is of interest, because superficial hairs on fern-scales are

unusual ; but they are universal among the Thelypteroid ferns, and I have suggested a relationship between *Thelypteris* and Cyatheaceae (*Journ. Linn. Soc. Bot.* 53 : 130. 1947). Similarly, in the small scales on costae of the pinnae of *Cyathea kingii* (which has reduced fertile leaflets, and belongs to Copeland's *Gymnosphaera* group 2) there are occasional thick-walled hairs or setae projecting from the margin ; these agree in colour and thick walls with the cells of the central band. Other parts of the margin are lacerate, with single thin-walled terminal cells, as shown in the margin of the large scales from the stipe.

Whether or not all other Cyatheaceae have flabelloid scales of similar general character, there is no doubt that the setiferous type of scale found in *Schizocaena brunonis* is very distinctive, and that species bearing such scales may be separated as a distinct group. If this group is to be recognized as a genus, it should be called *Sphaeropteris*, a name published in 1801 for a New Zealand species having scales of this character (*S. medullaris* Bernh., fig. 2). This group of species occurs in the Indo-Malayan region, Australia and New Zealand ; I believe it does not occur in tropical Africa and tropical America. I incline however to regard this group as a subgenus, because there is no obvious difference, apart from scales, from the rest of the family. Furthermore, Professor I. Manton informs me that she has found a chromosome number of 69 in *C. brunonis*, *C. contaminans* (setiferous scales) and also in *C. latebrosa* ; counts of all three have been made at Kew from plants sent by me from Malaya. The fact that *C. brunonis* has such a peculiar chromosome number in common with *C. latebrosa* indicates a high probability that they are not very far apart phyletically.

If we are to regard *Sphaeropteris* as a subgenus of Cyathea, and not as a distinct genus, even more clearly the same status should be accorded to *Gymnosphaera*, which is less sharply distinct than is *Sphaeropteris*. The very dark-coloured stipes and rachises do not provide a sharply defined character ; the simple veins are found also in *C. mexicana* Schl. ; the tendency to dimorphism is not a sharply definable character, and some members of the group show it only slightly (it occurs to some extent in *G. glabra*). In her account of the Cyatheaceae of Australia, Miss Tindale (*Contr. N.S.W. Nat. Herb.* 2 : 327–361, 1956) has separated *Gymnosphaera* as a section of Cyathea. She has only two species under *Gymnosphaera*, and they happen to be easily distinguishable from other Australian Cyatheaceae in their venation ; this distinction is not one that holds good for *Gymnosphaera* as a whole.

It is interesting to note that some members of the family Gleicheniaceae have scales with a setiferous margin exactly like that of *Cyathea brunonis* (e.g., *G. norrisii* Mett., placed by Copeland in the genus *Hicriopteris*). Other species of Hicriopteris have scales with long pale spreading flexuous marginal hairs, giving much more the impression of the flabelloid type of scale in Cyatheaceae.

I am indebted to Mr. Gordon P. DeWolf Jr. for permission to mention the substance of the unpublished results of his work in Singapore during the year 1952/53, and to Professor I. Manton for permission to include information about chromosome numbers ; also to the Director of the Royal Botanic Gardens, Kew, for allowing me access to specimens in the herbarium and to plants in the tropical fern-house.

Wild Flowers of Western Australia.*—Western Australia has lagged behind other states of the Commonwealth in the production of a state flora. Only the grass volume of the projected state flora has so far appeared, leaving numerous obstacles in the path of members of the general public desirous of obtaining the name of a plant, either as a matter of interest or of necessity. Although a comprehensive flora remains an essential desideratum, Blackall and Grieve's illustrated keys, the second volume of which has now appeared*, will meet with warm approval. The area covered includes the South Western Province and the western parts of the Eremean Province of Gardner, which together embrace the most populous areas of the state, where the need for a flora is most pressing. The keys are written in a simple and legible script which has been reproduced with the excellent line drawings that illuminate it. In this second volume every species is illustrated, diagnostic features being portrayed and often enough of the plant to indicate something of its habit. Taken with the keys, which are simple and well arranged, accurate diagnosis can be reached without much trouble. Even the beginner, following the instructions and using the glossary, should have little difficulty. Some of the descriptive terms are defined only by drawings, a few of which must puzzle a beginner. He would observe no essential difference between serrate and dentate leaf margins, nor between basal and free central placentation if both were in longitudinal section. In view of the high cost of colour reproduction, it is perhaps not surprising that this volume contains fewer colour plates than the first. The full page frontispiece is a fine representation of the blue *Leschenaultia biloba*, one of the splendours of the Western Australian bush. Four species are shown on each of the other plates all of which are of a high standard, although the black background has dulled the greens of some. A better representation of the diversity of the flora might have been given by limiting each genus to a single colour print, instead of devoting four to *Pimelea* and three each to *Hibbertia* and *Leschenaultia*. The value of the work is enhanced by the inclusion of the authorities for the scientific names in the index and an indication of the distribution by district. It is hoped that the appearance of the final volume will not be long delayed.

*How to know Western Australian Wild Flowers Part II, by W. E. Blackall & B. J. Grieve, University of Western Australia Press, 1956, pp. LVI and 138 and tt. 5. Price 30/-.

NEW AFRICAN FERNS.

F. Ballard

Cheilanthes similis *F. Ballard*, sp. nov. ; *C. heterophyllae* Willd. ex Klf. similis, sed frondium fertilum laminis minoribus minus divisis sine paleis, rhizomatum paleis linearibus edentatis, sporis globoso-tetrahedris laevibus sine perisporis differt.

Rhizome short-creeping ; scales light brown, linear, up to 10 mm. long, ·07 to ·13 mm. wide, widening at the base to a broader attachment, ·2 mm. wide. Sterile fronds with stipes 1·5 cm. to 5·0 cm. long, deep brown to blackish, loosely covered in long flexuous jointed straw-coloured or whitish hairs; lamina triangular, 4 cm. to 7 cm. long, 2·5 cm. to 5·0 cm. wide, deeply pinnatifidly lobed, gradually becoming pinnate towards the base, the lobes triangular at the apex of the frond, becoming oblong or lanceolate-oblong downwards, entire or crenate or with rounded lobes, the lower pinnae with basiscopically produced lobes. Fertile fronds on long blackish brown, slender, hairy stipes, 14 cm. to 15 (20) cm. long ; lamina triangular, 5·0 (10) cm. long, 3·0 cm. to 5·0 cm. wide, pinnate-pinnatifid, the lowest basiscopic lobes prolonged downwards and more or less lobed ; upper surfaces of all fronds hairy with long flexuous multicellular whitish or straw-coloured hairs, lower surfaces with hairs shorter and fewer. Indusium marginal, continuous ; sporangia without paraphyses ; spores trilete, globose-tetrahedral, smooth, without perispore, c. 53μ in diameter.

Northern Rhodesia. Mwinilunga District : Luakera Falls, north of Mwinilunga, on and by rocks on slope in open Brachystegia woodland, Jan. 25, 1938, *E. Milne-Redhead* 4351 (K, holotype). Abercorn District : Kambole Escarpment, edge of escarpment, Jan. 2, 1955, *Mrs. H. M. Richards* 3875.

Belgian Congo. Leopoldville : Kisantu ; Kimvula Mongo Kuhinsi, Jan. 16, 1948, *H. Callens* 692 (P); Kwango; Kambangu, *H. Callens* 3174, 3224 (B.M.).

French Congo. 18 km. from Pangala on road to Djambala, in fissures of quartzite exposed to the north-east, Dec. 22, 1947, *M. Nicklés* 64 (P).

Superficially, this species resembles *C. heterophylla* Willd. ex Klf. from Réunion which, however, has a much more divided fertile lamina bearing scales in addition to hairs. The scales are present on the stipes as well and together with those borne on the rhizome are characterised by abundant marginal and superficial teeth. Stalked club-shaped paraphyses are intermixed with the sporangia whereas in *C. similis* they appear to be absent. The spores of the two species are completely different. In *C. similis* they are globose-tetrahedral, clear brown, without perispore and with a pronounced triradiate scar. Those of *C. heterophylla* are blackish by reason of a dark, closely reticulate, rugose perispore and although in untreated spores no scars can be detected, they appear from their profile shape—broad elliptic, plano-convex or suborbicular—to be monolete. The species is well figured in Mdme. Tardieu-Blot's " Les Pteridophytes de l'Afrique Intertropicale Française ", p. 90, pl. xiv., f. 1 (1953) as *C. heterophylla* Willd.

Polystichum magnificum *F. Ballard*, sp. nov. Filix pulcherrima, paleis aureo-brunneis nitidis multiformibus vestita ; frondes bipinnato-pinnatifidae, segmentis ultimis rotundis crenatis crenis espinosis praeditae; rhachis frondis apicem versus gemmam paleiferam proliferam solitariam gerens ; sporae monoletae bilaterales minute echinulatae, 47μ to 63μ longae, 36μ to 41μ latae.

Polystichum magnificum F. Ballard. A pinna from *Hedberg* 965, scales not shown, natural size.

Tufted fern. Rhizome not seen but probably erect or suberect. Stipes stout, densely covered in thin, golden-brown or straw-coloured ovate-lanceolate acuminate scales up to 3·0 cm. long, 0·9 cm. wide, intermixed with much narrower to hair-like scales. Rhachises similar, particularly on the lower surfaces, with the broader scales restricted to the lower third, gradually becoming narrower towards the apex of the frond ; a solitary scaly proliferating bud, situated on the main rhachis 10–13 cm. from the apex. Fronds spreading, up to 1·10 m. long, including stipe ; lamina up to 79·0 cm. long, 25·5 cm. wide, lanceolate to ovate-lanceolate in outline, bipinnate-pinnatifid ; pinnae lanceolate to linear-lanceolate ; pinnules very shortly stalked, in outline rectangular in young fronds to obliquely ovate in mature fronds, the acroscopic proximal margin parallel with the costule, the basiscopic margin in mature fronds obtusely angled, pinnatifid as in figure, the basal acroscopic lobe ovate in outline, cut to the secondary costule, the other lobes progressively smaller and less deeply cut towards the obtuse shallowly lobed apex ; margins crenate or, at the most, bluntly serrate ; all surfaces, especially the lower, clothed in a tangled indumentum of long flexuous, hair-like, pale-brown or straw-coloured scales. Spores monolete, bilateral, broad elliptic in polar view, plano-convex in profile, surface minutely echinulate, 47μ–63μ long, 36μ–41μ wide (polar view).

Ethiopia. Gamo Province : Gughé Highlands, Dec. 1948, a fern which forms numerous large compact patches—up to about 6 ft. in diameter—in the closely grazed turf on the western slopes of Mount Tola and Mount Gughé proper, 3000 m. and upwards, *H. Scott* 159.

Uganda. Mount Elgon : 3750 m. alt., in the crater (alpine region) in a small sheltered cleft on the ridge north of Maji ya moto, May 16, 1948, *O. Hedberg* 965 (K, holotype).

Kenya Colony. Mount Elgon : 3750 m. alt., Nov. 1932, *Mrs. D. R. Tweedie* s.n.

This magnificent *Polystichum* is quite devoid of the aristate teeth so characteristic a feature of most species of the genus. A striking character seen in the more decompound fronds is the manner in which the rounded acroscopic basal lobes of the pinnules fit into the spaces created by the concave margins of the adjacent basiscopic lobes. The twin rows of annular spaces so produced are seen in the accompanying figure.

Of the material seen, the two collections from Mount Elgon are identical in every respect, even to the proliferating buds on the rhachises. The Ethiopian specimens, however, are more juvenile in appearance, lacking the proliferating buds and with pinnules only slightly lobed. The spore measurements are taken from untreated spores, being mounted direct into gum chloral.

Laboratory Experiments in Plant Physiology.*—Those who have to give laboratory instruction in plant physiology to university students no doubt have different opinions of how this can best be done. It would also seem that the students themselves are by no means unanimous concerning the way they would like to receive their instruction. When the reviewer showed "Plants in Action" to a young man who had recently studied botany at a British University, and asked him how he would have appreciated it as a laboratory manual of instruction, his reply was that he could have felt insulted. In spite of this dictum the reviewer was interested to see not just one, but quite a number of copies of the book in one of the principal bookshops in the University City where this same young man had recently been a student. A lecturer from an American University when confronted with the same book expressed the view that it is admirable for its purpose, and that it can be relied upon to stimulate even those students who would be left cold by one written on more traditional lines. What then does this book contain that it should arouse such strongly varying opinions. The first 16 pages, which are devoted to general tips on laboratory work, is profusely illustrated with

* Machlis, L. and Torrey, J. G. Plants in Action. pp. vi + 282 ; 64 illustrations. W. H. Freeman & Co., San Francisco, California, U.S.A. London Agents, Bailey Bros. & Swinfen Ltd. $3.75 (32/-) net.

line drawings showing such various items as one end of a laboratory bench, some plants in a greenhouse, seedlings being transplanted, the finger of a student being injured by broken glass, and 4 students surrounded by a hideous complexity of equipment who, the reader is invited to infer, are " discussing their results ". It is no doubt this very elementary and semi-humorous approach that some students would find to be irritating. From this point on, however, the book takes on a more useful and serious form for we have chapters that deal respectively with Plant Development, Mineral Nutrition, Water Relations, Cellular Metabolism and Photosynthesis. The experiments described under each of these headings are clearly presented, and illustrated with line drawings, so that a student should be able to carry out the instructions, and to appreciate what problems there are to be solved, and how far they are in fact answered, by the results that are likely to be obtained by performing the experiments. Following the text there are 3 useful appendices on electromagnetic radiation, determination of standard deviation and standard error, and on the sources and nature of laboratory supplies. These chapters, the appendices, and an index bring us to p. 162, leaving pp. 163–282 which consist of a practical notebook with printed headings under which the results of the experiments can be recorded.

In the reviewer's opinion there is much that is sound and helpful in the book, and, if it had been available in his own student days, he would have been glad to use it. It is, however, questionable whether the " introduction " and pp. 163–282 are really necessary. In these days when we all have to furnish so much information on so many topics on printed forms, it is questionable whether this method should be introduced to students so early in their careers. Would it not be more profitable for them to devise their own methods for recording their results, and for these methods afterwards to be criticised by the instructor if this should be necessary. If the book could be shortened by these omissions it would be less expensive, and would be more generally welcomed by students of all types and abilities.

C. R. Metcalfe.

NOTES ON AFRICAN GRASSES : XXV.*

Nematopoa, a New Genus from Southern Rhodesia.

C. E. Hubbard

Among the very numerous plants collected by Frederick Eyles in Southern Rhodesia is a slender-culmed grass with graceful purplish panicles, recalling in some structural details species of *Triraphis* and in others, the two species of *Crinipes*, *C. abyssinicus* (Hochst. ex A. Rich.) Hochst. and *C. longifolius* C. E. Hubbard. It was first named *Triraphis longipes* Stapf et C. E. Hubbard (Kew Bull. 1927 : 73, 1927), the genus *Triraphis* R. Br. then being treated in a very broad sense to include both *Neyraudia* Hook. f. and *Crinipes* Hochst. When a second species of true *Crinipes* (*C. longifolius* C. E. Hubbard) was received at Kew, confirming the differences between *Triraphis* and *Crinipes* as shown in the type-species *C. abyssinicus* (Hochst. ex A. Rich.) Hochst., it was decided to revive the latter genus (Kew Bull. 1935 : 306, 1935). At the same time *Triraphis longipes* was transferred to *Crinipes*, a position not considered entirely satisfactory, but which appeared to be the only possible one at that time. A wider range of specimens and species belonging to the *Crinipes–Triraphis* group of genera has now become available, the study of which has demonstrated the uniformity of *Triraphis* in the more restricted sense, and also the necessity for segregating *Crinipes* (or *Triraphis*) *longipes* from both genera. Accordingly the new genus *Nematopoa* (alluding to the capillary ramifications of the inflorescence), is proposed for the accommodation of *Triraphis longipes*.

Nematopoa resembles both *Crinipes* and *Triraphis* in its lemmas being 3-nerved, lobed and awned at the apex, and in possessing a bearded callus at the base of the floret. From the former genus it may be distinguished by the filiform leaf-blades, very lax panicles, loosely 4–7-flowered spikelets, extremely short callus of the florets, and by the small emucronate or awnless glumes, these being much shorter than the lowest lemma. From the latter genus it differs in the tips of the lemmas being narrowly and shortly 2-lobed, with the lobes acute or obtuse, whereas in *Triraphis* they are 3-lobed and 3-awned.

Nematopoa *C. E. Hubbard.* Genus novum, *Crinipedi* Hochst. affine, sed glumis minoribus hyalinis enervibus vel 1-nervibus lemmate infimo multo brevioribus, callo brevissimo, spiculis laxe 4–7-floris, lemmatum apicibus bilobis, lobis acutis vel obtusis, paniculis laxioribus minoribus, foliorum laminis filiformibus differt.

Spiculae oblongae, a latere compressae, aristatae, in ramis capillaribus paniculae pedicellatae ; rhachilla minute scaberula, gracillima, supra glumas et inter anthoecia oblique disarticulans. *Anthoecia* 4–7, ♂ ; callus brevissimus, obtusus, pilis brevibus dense barbatus. *Glumae* persistentes, parvae, lemmate infimo breviores, inaequales, tenuiter membranaceae, hyalinae ; inferior superiore brevior, anguste lanceolata, enervis ; superior anguste oblongo-lanceolata vel ovato-lanceolata, enervis vel 1-nervis. *Lemmata* contigua, glumas multo superantia, a latere visa anguste lanceolata, dorso convexa, marginibus angustis

*Continued from K.B. 1956 : 455.

inflexis, explanata oblongo-lanceolata, breviter et anguste biloba, lobis acutis vel obtusis plerumque minute mucronulatis, inter lobos aristata, membranacea, 3-nervia, nervis lateralibus prope margines sitis, prope margines conspicue albido-pilosa ; aristae tenuissimae, flexuosae, patulae vel demum recurvatae. *Paleae* lemmatis paullo breviores, anguste oblongae, obtusae, bicarinatae. *Lodiculae* 2, cuneatae, minutae, glabrae. *Stamina* 3 ; antherae lineari-oblongae. *Ovarium* glabrum ; styli terminales, liberi ; stigmata plumosa, purpurea, ex anthoeciis lateraliter exserta.

Gramen perenne, laxe caespitosum, e rhizomate gracili ortum ; innovationes extravaginales ; culmi erecti, graciles, simplices, 3–5-nodes ; ligulae ad seriem ciliorum brevium redactae ; laminae filiformes, obtusae, involutae vel leviter convolutae, firmae ; paniculae ovatae vel oblongae ; rami et ramuli capillares.

Species unica, Rhodesiae australis incolae.

Nematopoa longipes (*Stapf et C. E. Hubbard*) *C. E. Hubbard*, comb. nov.

Triraphis longipes Stapf et C. E. Hubbard in Kew Bull. 1927 : 73, fig. 2 (1927) ; Stent & Rattray in Proc. Rhod. Sci. Assoc. 32 : 62 (1933) ; Sturgeon in Rhod. Agric. Journ. 51 : 293 (1954). " Rhodesia : Salisbury, ... *Eyles* 2167 (type)."

Crinipes longipes C. E. Hubbard in Kew Bull. 1935 : 306 (1935), based on *Triraphis longipes* Stapf et C. E. Hubbard.

Southern Rhodesia : Salisbury, in swamps, 1440 m., April 1920, *Eyles* 1555 ! 2167 ! without precise locality, Feb. 1921, *S. Rhod. Govt. Herb.* 3047 !

According to Eyles it forms tussocks over 1 ft. in diameter, but produces very few inflorescences.

NOTES ON AFRICAN GRASSES : XXVI.*

Piptophyllum, a New Genus from Angola.

C. E. Hubbard

When the species of *Pentaschistis* recorded from tropical Africa were being examined, preparatory to their description for the Flora of Tropical Africa (10 : 123 134, 1937), it was noted that *P. welwitschii* Rendle differed in several important characters from all other species in the genus. At that time it was thought that it might be a species of *Crinipes* Hochst. or some closely allied genus, and a more detailed study was left until *Crinipes* was revised for the Flora. This has now been carried out, the conclusion reached being that *Pentaschistis welwitschii* occupies a rather isolated position in the *Triraphis–Crinipes* group of genera, bearing some resemblance in the structure of its spikelets to those of *Crinipes* and *Pentaschistis*, but sufficiently different from both to justify its separation as a distinct genus. For this new genus the name *Piptophyllum* is pro-

*Continued from K.B. 1957, 51.

posed, referring to the shedding of the leaf-blades, which are articulated with the sheaths just above the ligular zone.

Piptophyllum may be distinguished from *Crinipes* by its setaceous folded leaf-blades, the strictly two-flowered spikelets, usually 5–9-nerved lemmas, the slightly twisted awn, and the extremely short basal callus of the florets. It also differs conspicuously in habit, its culms being very slender and densely coated at the base with the woolly fibrous remains of the old leaf-sheaths. In *Pentaschistis* Stapf, the two florets are much shorter than and consequently enclosed by the glumes, whilst the lemmas are thinner and the awn geniculate.

Piptophyllum *C. E. Hubbard.* Genus novum *Crinipedi* Hochst. affine, sed foliorum laminis setaceis complicato-involutis, spiculis semper 2-floris, lemmatibus plerumque 5–9-nervibus, aristis basi demum leviter contortis, callo brevissimo distinguendum.

Spiculae oblongae vel cuneatae, a latere compressae, aristatae, in ramis capillaribus paniculae elongatae laxae pedicellatae ; rhachilla supra glumas et inter anthoecia disarticulans, supra anthoecium superum minute producta, internodiis brevissimis. *Anthoecia* 2, ♀, contigua ; callus brevissimus, obtusus, pilis brevibus dense barbatus. *Glumae* persistentes, leviter inaequales, lanceolatae vel oblongae, acutae vel apice minute dentatae, breviter mucronatae, tenuiter membranaceae, 1-nerves. *Lemmata* glumas superantia, dorso convexa, a latere visa lanceolata, explanata anguste ovata vel ovato-oblonga, superne angustata, apice biloba, lobis angustis brevibus seta brevi tenui terminatis, inter lobos aristata, plerumque 5–9-nervia, tenuiter herbaceo-membranacea, demum firma, inter nervos laterales et margines breviter et leviter pilosa ; aristae tenuissimae, curvatae vel flexuosae, basi applanatae et plerumque leviter contortae. *Paleae* lemmatis fere aequilongae, lanceolato-oblongae, obtusae vel minute bifidae, bicarinatae, tenuiter membranaceae. *Lodiculae* 2, cuneatae, minutae, glabrae vel apice pilis minutissimis paucis praeditae. *Stamina* 3 ; antherae lineari-oblongae. *Ovarium* glabrum ; styli liberi, terminales, breves ; stigmata plumosa, purpurea, ex anthoeciis lateraliter exserta. *Caryopsis* (immatura) anguste oblonga, teres ; scutellum circiter tertiam partem caryopseos aequans ; hilum lineare, breve.

Gramen perenne, caespitosum ; culmi gracillimi, erecti, simplices, supra basin enodes ; foliorum basalium vaginae lanatae, in fibras demum fissae ; ligulae ad seriem ciliorum brevium redactae ; laminae filiformes, arcte complicato-involutae, rigidae, a vaginis demum disarticulantes ; paniculae lanceolato-oblongae vel anguste oblongae.

Species unica, Angolae incola.

Piptophyllum welwitschii (*Rendle*) *C. E. Hubbard*, comb. nov.

Pentaschistis welwitschii Rendle in Cat. Afr. Pl. Welw. 2 : 213 (1899). " Pungo Andongo . . . . . near Cabondo, [*Welwitsch*] no. 2808 . . . . . Tunda-Quilombo, [*Welwitsch*] no. 7419."

Angola : Cuanza Norte ; near Cabondo, on rocks of the praesidium, Feb. 1857, *Welwitsch* 2808 ! (BM., K.). On the spongy sunny slopes of Tunda-Quilombo, May 1857, *Welwitsch* 7419 ! (BM., COI., K.).

NOTES ON AFRICAN GRASSES : XXVII.*

Crinipes Hochst., a Genus of Grasses from North East Tropical Africa.

C. E. Hubbard

This genus of African grasses, although described nearly a century ago, has received comparatively little notice, no doubt on account of its treatment as a synonym of *Danthonia* DC. by Bentham in the Genera Plantarum (3 : 1163, 1883) and by Hackel in Engler and Prantl's, Die Natürlichen Pflanzenfamilien (2 : Abt. 2, 57, 1887). Following his description of *Crinipes* in Flora (38 : 279–282, 1855), Hochstetter pointed out that his first examination of this Abyssinian grass was only of a cursory nature, nevertheless his preliminary determination as *Danthonia abyssinica* Hochst., being printed on the labels issued with Schimper's exsiccatae and followed by A. Richard's (Tent. Fl. Abyss. 2 : 419, 1851) description of it under this manuscript name, gained so great a measure of acceptance that the author's critical observations on the relationship of *Crinipes* to *Danthonia* and *Triraphis* R. Br. apparently escaped serious attention by most later botanists. Steudel (Syn. Pl. Glum. 1 : 244, 1854), like A. Richard, does not appear to have subjected it to careful study, for he too retained it in *Danthonia*, altering the specific epithet to *tenuiglumis* without any valid reason. A different treatment was adopted by Engler in his account of the high mountain flora of tropical Africa (Abh. Preuss. Akad. Wiss. 1891, 2 : 132, 1892), where it appears as *Triraphis abyssinica* Nees, a combination which had been suggested in a letter from Nees to Hochstetter. It was not until 1906 that *Crinipes* was resurrected from synonymy, when Pilger, having described his new genus *Lamprothrysus* (Engl. Bot. Jahrb. 37 : Beibl. no. 85, 61, 1906), proceeded to review some of the species correctly and incorrectly included in the allied genus *Danthonia*, and briefly summarised the main diagnostic features of *Crinipes*.

From *Danthonia*, *Crinipes* may be distinguished by its relatively small 1-nerved glumes (these being shorter than the spikelet), by the 3-nerved lemmas, and the straight or flexuous non-geniculate awns, whereas in typical species of *Danthonia* the glumes are 3–11-nerved, comparatively large and usually longer than all the florets or equalling them in length, the lemmas are 5–11-nerved and, when awned, the awn is usually geniculate and twisted below the bend. Judging from the number of characters they have in common, *Crinipes* is more closely related to *Triraphis* than it is to *Danthonia*. However, the lemmas in *Triraphis* are constantly 3-lobed, 3-awned and broader in the upper part, the central lobe being 2-toothed and awned from the sinus of the teeth, whilst the lateral lobes are awned from the inner side. On the other hand, the lemmas of *Crinipes* are narrowed at the apex into the awn and either entire there or narrowly and shortly 2-toothed, with the awn from the sinus, and the side teeth with or without short terminal bristles. The two genera may be recognised also by the type of hilum as seen in the caryopsis, that of *Triraphis* being punctiform and basal, whereas in *Crinipes* it is linear, about one-fourth to one-third the length of the caryopsis, and commences slightly above the base.

Continued from K.B. 1957, 52.

I included *Crinipes* and *Triraphis* in an enumeration of the genera of the *Eragrosteae* (Hook. Ic. Plant. 34 : sub tab. 3319, 1936), because of obvious resemblances in their external morphology to typical genera of that tribe. They do differ, however, from the latter in certain important anatomical characters which appear to be of still greater value as indicators of affinity. Thus the chlorenchymatous tissue in the leaf-blades of the two genera is continuous between the vascular-bundles and not restricted to rings around or bands of tissue flanking the bundles. There are also rows of the so-called " dumb-bell " shaped silica cells in the lower epidermis of the leaf-blade beneath the vascular bundles. Until these and related genera have been examined cytologically and their anatomy studied in greater detail, it would be unwise to create a new group for their reception. As they possess ciliate ligules, small cuneate-truncate lodicules and purplish or yellowish stigmas, characteristics of grasses with the small type of chromosome, they should not be included in the tribe *Festuceae*. In these features they approach the *Danthonieae*, in which, however, the lemmas are 5- or more- nerved, and the glumes relatively large in comparison with the rest of the spikelet. Pilger has referred *Crinipes* to the tribe *Arundineae* (Engl. Bot. Jahrb. 73 : 105, 1943 ; 76 : 325, 1954), a grouping which renders that tribe even more heterogenous than it is at present.

Description of the genus Crinipes.

Spikelets lanceolate-oblong to oblong, or becoming oblong-cuneate, laterally compressed, awned, pedicelled in loose or contracted panicles ; rhachilla disarticulating obliquely above the glumes and between the florets, produced beyond the uppermost floret, the internodes slender, minutely hairy, sometimes very short. *Florets* 2, rarely 3, ♀, or the uppermost reduced ; callus prominent, linear, truncate, bearded. *Glumes* persistent, unequal, with the lower shorter, narrowly lanceolate, acuminate, awnless, or more often mucronate or short-awned from the tip, thinly membranous, 1-nerved. *Lemmas* contiguous, exceeding the glumes, rounded on the back and with narrow incurved margins, narrowly ovate or narrowly oblong-ovate, acuminate, with the narrow tip entire or more often slightly 2-toothed, with the teeth short, narrow, acute, muticous or each bearing a short bristle, awned from the entire tip or from the sinus of the teeth, thinly scarious-membranous, 3-nerved, with the nerves converging upwards and often running into the lateral teeth, hairy between the lateral nerves and margins ; awns finely filiform, straight or flexuous, neither geniculate nor twisted. *Paleas* nearly as long as the lemmas, narrowly lanceolate to narrowly oblong, 2-keeled, flat between the keels, thinly membranous. *Lodicules* 2, small, cuneate, glabrous or minutely hairy. *Stamens* 3 ; anthers linear-oblong. *Ovary* glabrous ; styles terminal free, short ; stigmas densely plumose, yellowish, laterally exserted. *Caryopsis* free between the lemma and palea, linear-lanceolate to narrowly oblong, semi-terete, flat in front, rounded on the back ; embryo $\frac{1}{4}$–$\frac{1}{3}$ the length of the caryopsis ; hilum linear, $\frac{1}{4}$–$\frac{1}{3}$ the length of and placed just above the base of the caryopsis.

Caespitose perennials, with extravaginal innovations, and slender to moderately stout simple terete culms ; ligule a densely ciliate rim ;

blades linear to lanceolate-linear, flat or convolute, firm, fracturing from the sheaths just below or at the ligule ; panicles medium to large, lanceolate to oblong.

Crinipes *Hochst.* in Flora, 38 : 279 (1855) ; Pilger in Engl. Bot. Jahrb. 37 : Beibl. no. 85, 61 (1906) ; l.c. 73 : 105 (1943) ; l.c. 76 : 325 (1954). Type :—*C. abyssinicus* (Hochst. ex A. Rich.) Hochst. (*Danthonia abyssinica* Hochst. ex A. Rich.).

Species, 2, Abyssinia, Sudan and Uganda.

Awns 7–12 mm. long ; internodes of rhachilla 1–1·3 mm. long ; lateral teeth of lemma with or without fine bristles ; basal callus of both florets about 0·5 mm. long ; paleas glabrous or nearly so ; leaf-blades up to 6 mm. wide . . . . . 1. *C. abyssinicus*

Awns 3–8 mm. long ; internodes of rhachilla extremely short, about 0·2 mm. long ; lateral teeth of lemma muticous ; basal callus of upper florets 0·8–1·5 mm. long ; paleas pilose near the margins ; leaf-blades 5–14 mm. wide . . . . . 2. *C. longifolius*

1. **Crinipes abyssinicus** (*Hochst. ex A. Rich.*) *Hochst.* in Flora, 38 : 280 (1855) ; Pichi-Sermolli in Miss. Stud. Lago Tana, 7 : Ric. Bot. pt. 1 : 181 (1951). Based on *Danthonia abyssinica* Hochst. ex A. Rich.

Danthonia abyssinica Hochst. ex A. Rich. Tent. Fl. Abyss. 2 : 419 (1851). " Schimper Pl. Abyss. Sect. I. no. 114." The name was listed without description in Flora, 24 : I. Intell. 21 (1841).

Danthonia tenuiglumis Steud. Syn. Pl. Glum. 1 : 244 (1854). Change of name for *D. abyssinica* Hochst.

Triraphis abyssinica (Hochst. ex A. Rich.) Nees ex Engl. in Abh. Preuss. Akad. Wiss. 1891, 2 : 132 (1892). Based on *Danthonia abyssinica* Hochst.

A compactly tufted perennial, 45–90 cm. high ; innovations extravaginal, their buds plump, clothed with glabrous coriaceous cataphylls. *Culms* erect, moderately slender, simple, noded only near the base, glabrous, smooth. *Leaf-sheaths* tight, elongated, overlapping, glabrous, smooth ; ligule a very densely short-ciliate rim ; blades narrowly linear, with a fine flexuous tip, up to 40 cm. long, convolute, or opening out and up to 6 mm. wide, stiff, erect, closely nerved and sparsely pilose above, smooth beneath, scaberulous on the margins. *Panicles* lanceolate, contracted and rather dense, 12–23 cm. long, 2–4 cm. wide, pale brown, tinged with gold ; rhachis glabrous, smooth ; branches clustered, erect, filiform, divided from near the base and upwards, glabrous, the lower up to 14 cm. long ; branchlets and pedicels finely filiform, minutely scaberulous or smooth ; pedicels unequal, the lateral 1–3 mm. long, the terminal usually much longer. *Spikelets* lanceolate-oblong or oblong, 5–8 mm. long, loosely 2–3-flowered. *Glumes* narrowly lanceolate, gradually passing into a fine awned tip, with the awn straight or slightly recurved ; lower 4–6 mm. long (including the 1–2 mm. long awn) ; upper 5–8 mm. long (including the 2 4 mm. long awn). *Lemmas* narrowly ovate, 4–5 mm. long, slightly 2-toothed at the tip, with the teeth finely acute or each terminated by a fine bristle up to 3 mm. long, pilose with white hairs

near the margins, otherwise only minutely scaberulous in the upper part ; awns 7–12 mm. long, minutely scaberulous ; callus about 0·5 mm. long, bearded with white hairs up to 1·5 mm. long. *Paleas* narrowly lanceolate, with minutely scaberulous keels, glabrous or nearly so. *Lodicules* ciliate. *Anthers* 2·5 mm. long. *Caryopsis* linear-lanceolate, 2 mm. long, dark reddish-brown.

Abyssinia : Tigre ; Mt. Sholoda, clefts in rocks, 3-10-1837, *Schimper* 114 ! Amba Harres, 2500 m., 1862, *Schimper* 1007 (ex Engler). Lake Tana, on the west side near Alefa, on the banks of the warm stream of Fulluaha-Muhat, 1900 m., 27-2-1937, *Pichi-Sermolli* 1872 !

2. Crinipes longifolius *C. E. Hubbard* in Kew Bull. 1935 : 306 (1935) ; Eggeling, Annot. List Grasses Uganda, 18 (1944), ed. 2, 10 (1947). " Uganda : Bugishu ; Mt. Elgon, . . . *Thomas* 296 (type)."

Perennial, forming large loose tufts, 65–160 cm. high ; innovations extravaginal, their buds clothed with glabrous coriaceous cataphylls. *Culms* erect or spreading, slender to moderately stout, up to 3 mm. in diameter, simple, 4- or more-noded, glabrous, smooth. *Leaf-sheaths* tight, elongated, imbricate, terete, striate, obscurely pubescent between the nerves, becoming glabrous, smooth ; ligule a very short densely ciliate rim ; blades linear to lanceolate-linear, tapering to a long fine setaceous tip, up to 80 cm. long, flat, 5–14 mm. wide, or becoming convolute, stiff, pilose above near the ligule, and also with scattered hairs on the closely nerved upper surface, or like the lower surface quite glabrous, smooth except for the scabrid margins. *Panicles* ovate-oblong to oblong, loose and nodding, or erect, contracted and rather dense, pale brown and tinged with gold and purple, or golden-brown, 18–30 cm. long, 3–15 cm. wide ; rhachis glabrous, smooth ; branches fascicled, divided near the base and loosely to closely upwards, filiform, smooth ; branchlets and pedicels finely filiform ; pedicels unequal, the lateral 0·5–2 mm. long, the terminal longer. *Spikelets* oblong or oblong-cuneate, 4–6 mm. long, closely 2–3-flowered. *Glumes* narrowly lanceolate, acutely acuminate, usually mucronate, with the mucro up to 1·5 mm. long, minutely asperulous ; lower 3–4 mm. long ; upper 3·5–5 mm. long. *Lemmas* narrowly oblong-ovate, 3–4 mm. long, narrowed into the awn, or very shortly 2-toothed with the teeth narrow, acute and muticous, densely and softly pilose with white hairs near the margins ; awns 3–8 mm. long, minutely scaberulous ; callus of upper florets 0·8–1·5 mm. long, densely bearded with white hairs up to 1·5 mm. long. *Paleas* narrowly oblong, pilose near the margins, scaberulous on the keels above the middle. *Lodicules* glabrous. *Anthers* 2 mm. long. *Caryopsis* 1·8–2 mm. long.

Sudan : Equatoria Province ; Dongotona Mtns., Mt. Emogadung, frequent large coarse tussock grass in fell-field of peak, 2400 m., 28-10-1941, *Myers* 14190 ! Mt. Emogadung, gregarious in depression in rock, extreme summit of mountain, 2623 m., 21-1-1950, *Jackson* 1081 !

Uganda : Bugishu ; Mt. Elgon, Bulago, on moist rock, 1860 m., 27-8-1932, *Thomas* 296 ! Butandiga, cliff-edge, 2100 m., Jan. 1918, *Dummer* 3642 ! Buluganya, on rocks, occasional grass in large tufts, 8-12-1938, *Thomas* 2572 ! Karamoja ; Mt. Debasien, locally dominant, 2400 m., 30-5-1939, *Thomas* 2951 !

In addition to the two species described above, two more from southern Africa have been referred to *Crinipes*, viz., *C. longipes* (Stapf et C. E. Hubbard) C. E. Hubbard (Kew Bull. 1935 : 306, 1935) of Southern Rhodesia, and *C. gynoglossa* Goossens (Kew Bull. 1934 : 200, fig. 4, 1934) of the Transvaal. After a close study of the four species, I am convinced that certain similarities in the general structure of their spikelets previously considered as evidence of close affinity, indicate rather the wider degree of relationship one expects to find between genera of the same tribe. Accordingly *C. longipes* and *C. gynoglossa* have been separated from *Crinipes*, the former as the new genus, *Nematopoa*, described in Kew Bulletin, 1957, p. 51. An account of the second genus, based on *Crinipes gynoglossa* and a closely related new species from Natal, has been prepared by Mr. B. de Winter. These two species may be distinguished from true species of *Crinipes* by their densely caespitose habit, intravaginal innovations, woolly bases of the lower leaf-sheaths which split into fibres and densely coat the base of the culms, by the setaceous complicate-involute leaf-blades, small contracted panicles, 3–5-flowered spikelets, extremely short basal callus of the florets, 5–7-nerved short-awned lemmas, and the longer linear hilum of the caryopsis.

NOTES ON AFRICAN GRASSES : XXVIII.*
New Species from Tropical Africa.

C. E. Hubbard

Eragrosteae

Eragrostis trepidula *C. E. Hubbard*, sp. nov. ; affinis *E. pluriglumae* C. E. Hubbard, sed culmis gracilioribus, foliorum laminis angustioribus, spiculis minoribus, lemmatibus brevioribus differt.

Gramen perenne, dense caespitosum, circiter 70 cm. altum. *Culmi* erecti, graciles, stricti, teretes, rigidi, simplices, glabri, laeves, 2-nodes, prope nodos purpurei, internodio summo (pedunculo) elongato e vagina longe exserto. *Folia* plerumque basalia, glabra ; vaginae laeves, basales tenuiter striatae, imbricatae, purpureae, ceterae teretes, arcte appressae, internodiis breviores ; ligulae ad seriem obscuram pilorum minutorum redactae ; laminae filiformes, acutae, erectae, usque 30 cm. longae, involutae, 0·5–0·6 mm. diametro, subtus laeves, supra tenuiter nervatae, nervis asperulis. *Panicula* oblonga vel ovato-oblonga, laxa, 10–23 cm. longa, 4–6 cm. lata ; rhachis glabra, laevis ; rami solitarii, leviter patentes, laxe divisi, rigidiusculi, tenuiter filiformes, superne flexuosi, inferiores usque 8 cm. longi ; ramuli capillares, fere laeves ; pedicelli tenuissime capillares, laeves, flexuosi, usque 12 mm. longi, apice leviter incrassati. *Spiculae* ovato-rotundae vel rotundae, obtusae, lateraliter valde compressae, leviter tortae, cinereo-olivaceae, 4–5 mm. longae, 3 3·5 mm. latae, 7–9-florae ; rhachilla persistens, internodiis brevissimis glabris. *Glumae vacuae* 5–6, carinatae, chartaceae, glabrae ; I–IV

Continued from K.B. 1957, 54.

ovatae, obtusae vel acutae, 1–1·8 mm. longae, 1-nerves, laeves ; V–VI lemmati similes, late ellipticae, obtusae, 1·8–2 mm. longae, 3-nerves, carinis basin versus scaberulae. *Lemmata fertilia* arcte imbricata, a latere visa oblonga vel elliptico-oblonga, obtusa, acute carinata, demum horizontaliter patentia, 2–2·2 mm. longa, chartacea, glabra, laevia. *Paleae* demum deciduae, 1·8 mm. longae, anguste obovatae, obtusae, membranaceae, carinis pilis patulis dense ciliatae. *Antherae* 3, 0·8 mm. longae. *Fructus* anguste oblongus, 0·7 mm. longus, teres.

Angola : Lunda District ; Henrique de Carvalho (Saurimo), near R. Chicapa, in humidiherbosa, 1015 m., April 1937, *Gossweiler* 11666.

Chlorideae

Chrysochloa annua *C. E. Hubbard*, sp. nov. ; a *C. subaequigluma* (Rendle) Swallen, habitu annuo, culmis simplicibus, internodio summo (pedunculo) breviore, spiculis paullo brevioribus, antheris circiter 0·6 mm. longis differt.

Gramen annuum, usque 70 cm. longum, nonnunquam stoloniferum ; stolones e nodis radicantes, internodiis compressis usque 2·5 cm. longis glabris rigidis. *Culmi* laxe fasciculati vel solitarii, erecti, graciles, simplices, 4–5-nodes, glabri, laeves, nitentes, inferne compressi, superne teretes, internodio summo filiformi usque 10 cm. longo in vagina incluso vel ex ea breviter exserto. *Foliorum vaginae* ore ciliato excepto glabrae, laeves, firme chartaceae, purpureo-tinctae, basales arcte imbricatae, a latere valde compressae, acute carinatae, 2–5 cm. longae, intermediae carinatae, internodiis demum multo breviores ; ligulae brevissimae, truncatae, minute ciliolatae ; laminae glauco-virides, glabrae, arcte conduplicatae et carinatae vel explanatae et late lineares, explanatae apice obtusae vel abrupte apiculatae, marginibus et carina apicem versus minute scaberulae, ceterum laeves, inferiores 8–14 cm. longae et usque 6 mm. latae, superiores breviores, summae ad mucronem redactae. *Spicae* 4-natae, plus minusve erectae, 6–7 cm. longae, graciles, strictae ; rhachis gracillima, circiter 0·5 mm. lata, marginibus scaberula. *Spiculae* subsessiles, elliptico-ovatae, demum elliptico-oblongae et oblongae, dense imbricatae, a latere valde compressae, 3–3·6 mm. longae, flavido-virides. *Glumae* subaequales, spicula aequilongae, carinatae, tenue scarioso-membranaceae, 1-nerves, glabrae, carina viridi scaberulae ; inferior asymmetrica, explanata lanceolato-oblonga, acuta ; superior explanata ovata, obtusa, prope apicem aristam 0·5–0·9 mm. longam gerens. *Anthoecium inferum* ♂ ; callus brevissimus, obtusus ; lemma carinatum, explanatum ovato-oblongum, subacutum, usque 3·5 mm. longum, integrum, nervo medio (carina) pilis appressis et nervis lateralibus pilis longioribus patentibus usque 2 mm. longis dense albo-ciliatum, scarioso-membranaceum, translucens, 3-nerve, aristatum ; arista subterminalis, usque 1·8 mm. longa ; palea lanceolata, acuta, lemmate paullo brevior, membranacea, carinis circa medium minute ciliolata ; antherae 0·6 mm. longae. *Anthoecium superum* sterile, 2 mm. longum : lemma explanatum elliptico-ovatum, obtusum, glabrum, exaristatum ; palea linearis.

Gold Coast : Northern Territories ; Lake Kpre, Damongo, in seasonally wet shallow pans, 1948, *Hinds* 16 (1948).

With the description of this new grass, the number of published species is increased to six. Two of these, *C. lucida* (Swallen) Swallen and *C. subaequigluma* (Rendle) Swallen are from Angola ; *C. orientalis* (C. E. Hubbard) Swallen occurs in the drier parts of Kenya, Tanganyika and Uganda ; *C. hubbardiana* Germain & Risopoulos is from the Belgian Congo ; the fifth, *C. hindsii* C. E. Hubbard, is another Gold Coast species. In addition, there are in the Kew Herbarium two gatherings made by Johnson (no. 1018) in March 1902, at Christiansborg, near Accra, and by Asima (SLUS/120) on 3 April, 1952, on well-drained clayey soils on lower slopes of Accra Plains, Gold Coast, which may be yet another new species of this genus. It is a densely tufted perennial, with a short rhizome, numerous basal leaves and closely imbricate sheaths. There is no sign of the stolon development found in other species, but as the remains of such growth are often broken off during gathering, further collections must be awaited before a decision on the reliability of this caespitose characteristic can be given. In addition to differences in habit, it may be distinguished from *C. annua* by its glabrous palea. *C. hindsii* (Kew Bull. 1949 : 349, 1949) may be separated from *C. annua* by its shorter culms, leaf-blades and spikes. *C. hubbardiana* (Bull. Jard. Bot. Brux. 22 : 71, 1952) is a stoloniferous perennial, with leaf-blades up to 10 mm. wide, and with from 6 to 9 spikes. It differs also from *C. annua* in the marginal hairs of the lemma being shorter (up to 1 mm. long) and in having longer anthers (1·5 mm. long).

Chaetostichium majusculum *C. E. Hubbard*, sp. nov. ; affine *C. minimo* (Hochst.) C. E. Hubbard, sed spiculis aristis et lemmatibus longioribus, gluma superiore 1–3-nervi differt.

Gramen perenne, dense caespitosum, 10–15 cm. altum, basi vaginis vetustis indutum ; innovationes intravaginales. *Culmi* erecti, filiformes, simplices, 1 2-nodes, glabri, laeves. *Foliorum vaginae* tenuiter striatae, laeves, marginibus apicem versus ciliatae vel glabrae, basales persistentes, latiusculae ; ligulae ad seriem ciliorum brevissimorum redactae ; laminae angustissime lineares vel setaceae, apice subobtusae, 1–6 cm. longae, convolutae vel involutae vel explanatae et usque ad 1 mm.latae, strictae vel curvatae, rigidiusculae, pilis patulis albis laxe pilosae, glauco-virides vel purpureae. *Spicae* unilaterales, curvatae vel flexuosae, gracillimae, usque 8 cm. longae, virides ; rhachis dorso leviter convexa, usque ad 0·8 mm. lata, infra spiculam demum horizontaliter disarticulans. *Glumae* glabrae ; inferior in spiculis lateralibus late oblonga, minuta, hyalina, enervia ; superior anguste lanceolata, 4 5 mm. longa (parte basali), in aristam tenuissimam minute scaberulam strictam flexuosam vel demum recurvatam 8 17 mm. longam gradatim attenuata, 1–3-nervis, coriacea, marginibus albis exceptis viridis. *Lemma* carinatum, explanatum anguste ovatum, 2·8–3·3 mm. longum, apice minute bidentatum, nervo medio in aristam usque 1 mm. longam producto, dorso minutissime asperulum ; callus brevissimus, pilis albis usque 1 mm. longis barbatus. *Palea* lanceolata vel oblongo-lanceolata, lemmati subaequilonga, glabra. *Antherae* 0·7–0·8 mm. longae. *Caryopsis* lanceolata, 2 mm. longa, pallide brunnea.

Kenya Colony : Turkana District ; 80 miles north of Lodwar, lava desert with sparse trees and scrub, 21 May 1953, *Padwa* 184 ! Meru

District ; 10 miles north-east of Isiolo, fairly frequent in open grassland (semi-desert), on rocky ground, 13 Dec. 1949, *Bogdan* 2710 ! (type). Masai District ; 45 miles from Nairobi on the Nairobi–Magadi road, 1050 m., grassland with scattered bush, in white rocky soil, 26 June 1952, *Bogdan* 3468 !

Judging from other examples of species-pairs in the *Gramineae* in which the chromosome numbers are known and in which the main distinctions are differences in the sizes of the spikelets and their parts, it is very probable that *C. majusculum* has double the number of chromosomes of *C. minimum*.

Chaetostichium minimum (Hochst.) C. E. Hubbard (in Hook. Ic. Plant. 34 : tab. 3341, 1937 ; *Lepturus minimus* Hochst. ; *Oropetium minimum* Pilger) has already been recorded from Eritrea, Abyssinia and British Somaliland. Recently it has been gathered by *Gillett* in the Northern Frontier Province of Kenya, at Furroli, on lava plain, 920 m., 14 Sept. 1952 (no. 13851), and at Dandu, on red eroding gravelly soil, 780 m., 16 May 1952 (no. 13208). In *C. minimum* the basal part of the upper glume is up to 3 mm. long and bears an awn up to 7 mm. long, whilst the lemmas are 1·5–2·5 mm. long.

Arundinelleae

Loudetia falcipes *C. E. Hubbard*, sp. nov. ; affinis *L. baldwinii* C. E. Hubbard, sed culmis plerumque simplicibus, vaginis plerumque glabris, paniculis latioribus, pedicellis longioribus, lemmate superiore pilis appressis dense pilosis, arista columna brevi praedita differt.

Gramen perenne, laxe caespitosum, usque 1·2 m. altum, e rhizomate gracili ortum. *Culmi* erecti, graciles, teretes, usque 2 mm. diametro (vaginis inclusis), plerumque simplices, vel raro ramosi, rigidi, usque 10-nodes, glabri, prope paniculam asperuli, ceterum laeves, internodiis inferioribus albido-pruinosis. *Foliorum vaginae* arcte appressae, teretes, tenuiter striatae, basales prope basin appresse pubescentes, ceterae glabrae, apicem versus minutissime asperulae, superioribus exceptis internodiis longiores ; ligulae ad seriem densam ciliorum redactae ; laminae anguste lineares, in acumen setaceum attenuatae, usque 27 cm. longae et 4·5 mm. latae, planae vel siccitate involutae, virides, glabrae, minute asperulae. *Panicula* ovata vel ovato-oblonga, laxa, 10–18 cm. longa, usque 10 cm. lata ; rhachis gracillima, tenuiter striata, scaberula, nodis pubescens, ceterum glabra ; rami oblique patentes, 2–5-nati, tenuiter filiformes, supra medium vel apicem versus sparse divisi, ramulis patentibus capillaribus, minute scaberuli, in axillis pubescentes et apice hirsuti, ceterum glabri, inferiores usque 8 cm. longi ; ramorum et ramulorum apices demum recurvati ; pedicelli inaequales, 1·5–5 mm. longi, ut ramorum ramulorumque apices pilis patulis albis usque 3 mm. longis e tuberculis minutis atrobrunneis ortis hirsuti. *Spiculae* apicibus ramorum et ramulorum per triades fasciculatae, 4·5–6 mm. longae, hiantes, pallide brunneae vel purpureo-tinctae. *Glumae* anguste ovatae, acuminatae, tenuiter acutae, margines versus pilis albis usque 2 mm. longis e tuberculis minutis brunneis ortis laxe hirsutae, chartaceae ; inferior 3–4 mm. longa, longe acuminata, 3-nervis ; superior spiculam aequans, 5–7-nervis. *Anthoecium inferum* ♂ : lemma glumae superiori

aequilongum vel paullo brevius, ovatum, acuminatum, apice obtusum, chartaceum, glabrum, 7-nerve ; palea lanceolato-oblonga, obtusa, 2·7–3·3 mm. longa, carinis et apice ciliata. *Anthoecium superum* elliptico-oblongum : callus rotundato-truncatus, 0·3 mm. longus, pilis usque 1 mm. longis barbatus ; lemma 3·5–4 mm. longum, acute bilobum, lobis breviter mucronatis 1–1·5 mm. longis, pilis appressis dense pilosum, 7-nerve ; arista 4–5 mm. longa, columna brunnea laevi 1–1·5 mm. longa ; palea anguste oblonga, 3 mm. longa, inter carinas appresse pilosa. *Antherae* 3, usque 2 mm. longae.

Liberia : Western Province ; Kolahun District, on rock outcrop near Genne-Loffa, 2 Nov. 1947, *Baldwin* 10085. Vonjama District, rock outcrop near Soplima, 1 Nov. 1947, *Baldwin* 10058 (type).

This Liberian representative of the sect. *Pseudotristachya* is very closely related to *L. baldwinii* C. E. Hubbard, which was described from specimens gathered by the same collector, Professor J. T. Baldwin, Jr., on an open rock hill at Macenta in French Guinea, up to 60 miles north of the Liberian localities for *L. falcipes*. In both species the apices of the branches become recurved below each triad of spikelets, but the position of the triads in the fresh state, whether erect or deflexed, cannot be deduced with certainty from the pressed material, although the general tendency is for them to be erect. This modification of the hairy apices of the branches on which the triads are borne in a manner somewhat suggestive of the bait at the tip of a hook, is apparently a device favouring wide seed-distribution, since the branches readily break in the curvature, while the hairy branch-tip, pedicels and glumes would anchor the triads in the coats of moving animals. In addition to this probable means of seed dispersal, there is also an articulation at the base of the awned upper floret which frees it and the enclosed seed at maturity from the remainder of the spikelet.

Loudetia thoroldii *C. E. Hubbard*, sp. nov. ; affinis *L. ternatae* (Stapf) C. E. Hubbard, internodiis superioribus culmorum hirsutis, paniculis majoribus et laxioribus, spiculis et aristis brevioribus, gluma inferiore late ovata, callo truncato-emarginato differt.

Gramen perenne, caespitosum, 1·7–2·4 m. altum. *Culmi* erecti, validi, teretes, 4–6 mm. diametro, simplices, 3-nodes, rigidi, internodiis primo albido-pruinosis, glabris vel pilis erectis plus minusve hirsutis. *Foliorum vaginae* internodiis longiores, teretes, glabrae, laeves, basales elongatae, persistentes ; ligulae ad seriem ciliorum redactae ; laminae lineares, in acumen tenue scabridum longe attenuatae, usque 80 cm. longae et 5 mm. latae, planae, vel siccitate convolutae, firmae, glabrae, supra prominente et arcte nervatae, nervis plerumque minute asperulae vel laeves, subtus laeves, marginibus scabridae. *Panicula* ovata vel oblonga, laxissima, 50–70 cm. longa, usque 25 cm. lata, erecta ; rhachis stricta, rigida, inferne teres appresse hirsuta vel scabrida, superne angulata, scabrida, internodiis inferioribus usque 16 cm. longis ; rami verticillati, numerosi, usque 18-nati, oblique patentes, superne sparsissime divisi, gracillimi, scaberrimi, inferiores usque 20 cm. longi ; pedicelli 2–2·5 mm. longi, laeves, glabri vel prope apicem pilis rigidis singulis vel duabus praediti. *Spiculae* apice ramorum per triades fasciculatae, lanceolato-oblongae,

5·7·5 mm. longae, pallide brunneae. *Glumae* rigide chartaceae, 3-nerves ; inferior late ovata vel elliptica, rotundato-truncata, 3–4 mm. longa, nervis lateralibus pilis (3–7) rigidis setiformibus albidis e tuberculis atro-brunneis ortis praedita, cetera glabra, laevis ; superior lanceolato-oblonga, acuminata, truncata, lemmati infero aequilonga vel eo paullo brevior, glabra, laevis. *Anthoecium inferum* ♂ : lemma glumae superiori simile ; palea lanceolato-oblonga, emarginata, lemmate paullo brevior, membranacea, carinis angustissime alatis, alis minute ciliolatis. *Anthoecium superum* lanceolato-oblongum : callus truncato-emarginatus, 0·3 mm. longus, pilis albis erectis usque 1·3 mm. longis barbatus ; lemma 4·5 5·5 mm. longum, acute bilobum, lobis usque 1 mm. longis, tenuiter coriaceum, 7-nerve, glabrum ; arista geniculata, 1·4–2 cm. longa, columna 7 8 mm. longa atro-brunnea minute hispidula ; palea linearis, truncata, lemmati aequilonga. *Antherae* 2, 2–2·5 mm. longae.

Gold Coast : Northern Territories ; Damongo, in orchard grassland near old Rest House, Nov. 1948, *Thorold* 285 (type). Tamale, 8 Oct. 1949, *Baldwin* 13565. Kpandae, swampy places and along rivers, 27 Nov. 1953, *Adesi* SLUS/443.

An addition to the section *Pseudotristachya*, which now comprises nine species from west tropical Africa. It is most closely related to *Loudetia ternata* (Stapf) C. E. Hubbard, a species which in view of its occurrence in Dahomey, at Koukomba, between Sokode and Basari (*Kersting* 575) and in French Guinea at Kouroussa (*Pobéguin* 510), may reasonably be expected from some station in the Northern Territories of the Gold Coast. *L. ternata* may be distinguished from *L. thoroldii* by its smooth culms, narrow contracted panicles (2·5–3·5 cm. wide), with shorter erect 4–6-nate branches (up to 10 cm. long), longer spikelets (7·5 9 mm. long), relatively narrower rounded-tipped oblong-ovate lower glume and the sparsely setulose-tuberculate upper glume.

Arundinella effusa *C. E. Hubbard*, sp. nov. ; affinis *A. pumilae* (Hochst. ex A. Rich.) Steud., sed spiculis majoribus et aristis longioribus differt.

Gramen annuum, 35–50 cm. altum. *Culmi* fasciculati, erecti, graciles, prope basin 1–2-nodes, e nodis ramosi, ramulis erectis, teretes, glabri, laeves. *Folia* pallide viridia ; vaginae nodis appresse pubescentes, marginibus ciliatae, ceterum glabrae, laeves, teretes, tenuiter striatae, internodiis longiores ; ligulae truncatae, membranaceae, usque 1 mm. longae, glabrae ; laminae anguste lanceolatae, basin versus angustatae, basi abrupte contractae, apice acutae, 7–22 cm. longae, 7–15 mm. latae, planae, tenues, flaccidae, tenuiter nervatae, marginibus scaberulae, ceterum glabrae et laeves. *Paniculae* effusae, late ovatae vel obovatae, erectae, ramosissimae, terminales usque 24 cm. longae et 18 cm. latae, laterales eis breviores ; rhachis superne minute scaberula, ceterum laevis ; rami solitarii, oblique patentes, usque 12 cm. longi, tenuiter filiformes, minute scaberuli, basi pubescentes ; ramuli et pedicelli capillares, minute scaberuli ; pedicelli 2–5 mm. longi. *Spiculae* a dorso visae anguste ellipticae et acuminatae, hiantes, 2·6–3 mm. longae, pallide virides vel purpureo-suffusae. *Glumae* glabrae, tenuiter membranaceae ; inferior ovata, acuta, breviter mucronata, 2–2·5 mm. longa, 3-nervis ; superior spiculam aequans, ovata, rostrato-acuminata, apice emarginata

vel truncata, 5-nervis. *Anthoecium inferum* ♂ vel sterile ; lemma ellipticoovatum, obtusum vel minutissime emarginatum, 1·7–2 mm. longum, tenuiter membranaceum, 5-nerve ; palea anguste elliptica, truncata, 1–1·6 mm. longa, hyalina. *Anthoecium superum* ♀ : lemma explanatum late ellipticum, minute truncato-emarginatum, 1·2–1·3 mm. longum, minute scaberulum, obscure 3-nerve, demum aureo-brunneum, aristatum ; arista geniculata, usque 4 mm. longa, columna brunnea usque 2 mm. longa ; callus minute barbatus ; palea lemma aequans, minute scaberula. *Antherae* 2, 0·3–0·4 mm. longae. *Caryopsis* anguste oblonga, 0·8 mm. longa.

British Cameroons : Bamenda District ; Metschum River Falls, on moist rocks below falls, 8 Jan. 1951, *Keay & Russell in Forest Herb. Ibadan no.* 28524 (typus in Herb. Kew.).

Arundinella pumila Steud., to which the above new species is very closely related, is widespread in India ; it occurs also in Burma, Abyssinia, Eritrea, and has been recorded from a single locality, Wana, near Lafia, Northern Nigeria, where it was collected in Nov. 1936, on rocks alongside a stream, by I. D. Hepburn (no. 157). Throughout its area of distribution *A. pumila* is remarkably uniform in the size of its spikelets, these varying from 1·3–2 mm. in length, a range in size found in spikelets from the same inflorescence. Sparsely scattered fine white hairs occur on the rhachis of most gatherings of this species, whilst in Indian material the glumes are occasionally slightly hairy. It is in spikelet-size, however, that *A. effusa* differs so markedly from *A. pumila.* Judging from other examples in the *Gramineae*, it is probable that *A. effusa* has been derived from *A. pumila* by a doubling of the chromosomes. The third African species, *A. ecklonii* Nees, may be readily separated from the other two, by its perennial habit, taller and stouter culms, linear leaf-blades, narrowly oblong to oblong panicles and by its longer spikelets (4–6 mm. long).

NOTES ON AFRICAN GRASSES : XXIX.*

A New Species of Eleusine from Tropical and South Africa.

J. Kennedy-O'Byrne

The common tropical weed, *Eleusine indica* (L.) Gaertn., is the most successful species of its genus and, although at one time perhaps confined to north-east tropical Africa and western tropical Asia, it is now widespread throughout the tropics. It has also become established in warm temperate regions and has been found as an adventive as far north as the British Isles and south as far as New Zealand.

In Africa, robust plants which have previously been regarded as conspecific with the diploid (2n = 18) *Eleusine indica* have now been found to be tetraploid (2n = 36) and, on account of this cytological and of other morphological differences, are here recognized as a distinct species under the name *Eleusine africana* Kennedy-O'Byrne.

Eleusine africana *Kennedy-O'Byrne*, species nova ; affinis *E. indicae* (L.) Gaertn., sed plantis robustioribus, culmis validioribus, spicis et rhachi latioribus, spiculis lemmatibusque longioribus et latioribus differt.

Gramen annuum, robustum, usque 1 m. altum. *Culmi* basi plerumque geniculati, usque 7 mm. lati, lateraliter valde compressi, 3-pluri-nodes, nodis inferioribus ramosi ; internodia ex vaginis partim exserta. *Folia* plerumque glabra, tenuiter striata ; vaginae compressae, laeves, marginibus liberis ; ligulae ad seriem ciliorum usque 2 mm. longorum redactae ; laminae lineares, acutae, usque 50 cm. longae et 10 mm. latae, conduplicatae et lateraliter compressae, glabrae et laeves vel supra pilos paucos gerentes et secus nervos minute scaberulae. *Inflorescentia* erecta, usque 17 cm. longa, flabelliformis ; axis primarius inferne valde lateraliter compressus, acute marginatus, superne angulatus. *Spicae* digitatae vel subdigitatae (spicis inferioribus 1–2 usque 5 cm. distantibus), 4–17, erectae vel oblique patentes, 6–15 cm. longae, 4–6 mm. latae, dense spiculatae ; rhachis linearis, 1·5–2 mm. lata, stricta, triquetra vel costa media excepta fere plana, laevis. *Spiculae* imbricatae, ovato-ellipticae vel ovatae, 6–7·5 mm. longae, 3–4 mm. latae, 4–6-florae, glabrae. *Glumae* herbaceae, demum marginibus hyalinis latis exceptis coriaceae ; inferior plerumque 2·5–3 mm. longa, a latere visa anguste lanceolato-oblonga, acuta vel obtusa, 1–3-nervis, carina late alata et scabrida ; superior plerumque 4–5 mm. longa, a latere visa lanceolato-oblonga, acuta, carina anguste alata et laevi vel scabrida, 5-nervis. *Lemmata* lanceolata, acuta vel obtusa, plerumque 4–5 mm. longa, 1–5-nervia, marginibus latis hyalinis, carina superne anguste alata. *Paleae* 3–4 mm. longae, nervis cum pilis antrorsis ciliatis. *Lodiculae* 2, lobatae vel truncatae, 0·5 mm. longae. *Antherae* oblongae, 0·8–1 mm. longae. *Fructus* pericarpio membranaceo libero translucente praeditus ; semen ovato-oblongum, apice et basi truncatum, triquetrum, 1·3–1·5 mm. longum, 0·8 mm. latum, demum induratum, atrorubrum vel nigrum, puncticulatum, transverse rugosum ; scutellum parvum, basale.

*Continued from K.B. 1957 : 61.

Eleusine africana *Kennedy-O'Byrne*, sp. nov.

A robust tufted annual up to 1 m. high. *Culms* often geniculate at base, up to 7 mm. wide and strongly compressed, 3– several-noded, branched at the lower nodes up to the second degree ; internodes partially exserted from or exposed by the spreading leaf-sheaths, glabrous and smooth. *Leaves* usually glabrous, finely and closely ribbed ; sheaths compressed, loose and torn at base, becoming progressively tighter higher on the culm, split along entire length, spreading and open upwards with margins free at the mouth ; ligule represented by a fringe of short hairs up to 2 mm. long ; blades linear, acute at the apex, up to 50 cm. long and 1 cm. wide, laterally compressed or folded along the midrib, upper surface glabrous or with a few scattered hairs, smooth or minutely rough along the veins, lower surface and margins smooth, glabrous. *Inflorescence* erect, up to 17 cm. long, fan-shaped, digitate or subdigitate, often with one or two spikes distant below by as much as 5 cm. from the apical cluster ; primary axis strongly laterally compressed with sharp margins along the lower barren part, becoming angular above by the decurrent ridges below each spike of the apical cluster. *Spikes* 4–17, erect or spreading obliquely, 6–15 cm. long, 4–6 mm. wide, dense ; rhachis linear, 1·5–2·0 mm. wide, straight, triquetrous or almost flat except for a raised midrib, smooth. *Spikelets* closely imbricate, ovate-elliptic to ovate, 6·0–7·5 mm. long, 3–4 mm. wide, 4–6-flowered, glabrous. *Glumes* herbaceous, becoming coriaceous except for the broad hyaline margins ; lower $\frac{1}{3}$–$\frac{1}{2}$ length of spikelet, mostly 2·5–3 mm. long, narrowly lanceolate-oblong in profile, acute or obtuse at the apex, broadly winged and scabrid on the keel, 1–3-nerved ; upper $\frac{2}{3}$–$\frac{3}{4}$ length of spikelet, mostly 4–5 mm. long, lanceolate-oblong in profile, acute at the apex, narrowly winged, smooth or scabrid on the keel, 5-nerved. *Lemmas* lanceolate, mostly 4–5 mm. long, acute or obtuse at apex, narrowly winged along the upper three-fourths of the keel, herbaceous, becoming coriaceous except for the broadly hyaline margins, 1-nerved or usually obscurely 5-nerved. *Paleas* $\frac{3}{4}$–$\frac{4}{5}$ length of lemmas, 3–4 mm. long, winged along the paired nerves, bearing antrosely spreading cilia. *Lodicules* 2, lobed or truncate, 0·5 mm. long. *Anthers* 0·8–1·0 mm. long, oblong. *Ovary* obconical, 1 mm. long, with a pronounced dorsal ridge ; styles terminal, separate, slender, 0·75 mm. long ; stigmas shortly plumose. *Fruit* 2·0 mm. long × 1·0–1·3 mm. wide, with a free membranous and translucent pericarp ; seed ovate-oblong, truncate at base and apex, triangular in transverse section, 1·3–1·5 mm. long, 0·8 mm. wide, very hard, black or dark red, surface very rough, minutely punctate, marked by transversely radiating ridges when dry, ovoid or globose when moist ; scutellum small and basal.

Type :— South Africa. Cape Province : Kimberley District ; Warrenton-on-Vaal, 3.1950, *Wilman* H.K.1.

General Distribution :—indigenous to tropical and South Africa and recorded as an adventive in the British Isles and Sweden.

Enumeration of specimens examined (all in Herb. Kew.) :—

Senegal. Without locality, 15.9.1907, *Farmar* 140.

Gambia. Western Division : Yundum, 5.12.1952, *Austin* 12 (190) ; without locality, 1937, *Saunders* 76.

FRENCH GUINEA. Kindia district, *Felix Jacques* 170.

GOLD COAST. Northern Territories : 5.7.1932, *Lloyd Williams* 836. Ashanti Province : Kumasi, 9.3.1948, *La Danso* 20.

FRENCH NIGER COLONY. Niamey, 11.10.1927, *O. Hagerup* 509.

NIGERIA : Northern Region : Kworre (16 miles north of Sokoto), Experimental Farm, 10.1933, *Palmer* 13. Sokoto Province : Sokoto, 11.1921, *Moisier* 141 ; Katagum District, 5.1908, *Dalziel* 281 ; Naraguta, 7.1930, *Lely* 415. Plateau Province : Pankshin Division, Vodni, *Saunders* 26.

BELGIAN CONGO. Kivu Province : Rutshuru, Busenene, 16.11.1953, *Van Ysacker* 81 ; Ruanda Province, Rubengera, 1928, *Scaetta* 48. Katanga : *Quarre* 1213.

SUDAN. Gallabat : Matamma, 17.9.1865, *Schweinfurth* 1576. Dafur Province : Southern District, Nyala, Wadi Bulbul, *Harrison* 200. South Kordofan : Talodi, *Broun* 1362 (? 1363). Upper Nile Province : Doro, near Jongols Post, 26.8.1951, *Sherif* A 3980 ; Zeraf Island, Barboi Wood Station, 6.10.1950, *Harrison* 1003. Bar el Ghazal : Wau, 28.8.1869, *Schweinfurth* 2308. Equatoria Province : Lado District, 25.3.1919, *Cartwright* 30.

ERITREA. Bogos, Keren, 2.9.1902, *Pappi* 154.

ABYSSINIA. Tigre or Begemdir, 1863–68, *Schimper* 992. Soddu District, Nadda, 22.10.1954, *Mooney* 6108.

UGANDA. Northern Province : White (Albert) Nile, Arua, 5.1938, *Hazel* 565A ; Acholi District, Gulu, 6.1956, *Hirst* H.K. 9 ; Lango District, Arnku, 30.6.1934, *Johnston* 924 ; Ngetta, 8.1955, *Hirst* H.K. 5. Eastern Province : Teso District, Kaberamaido, 8.1955, *Hirst* H.K. 1, 3, 7 & 8 ; Serere, 4.1932, *Chandler* 725A ; 8.1955, *Hirst* H.K. 2, 4 & 6 ; 6.1956, *Hirst* H.K. 10, 11, 12, 13 & 14 ; Mt. Elgon, Butandiga, 9.12.1927, *Snowden* 1226. West Province : Kigezi District, *Liebenberg* 379 ; 7.1949, *Purseglove* 3012 ; Toro District, Fort Portal, 4.3.1932, *Hazel* 182 ; Ankole District, Mbarara, 3.8.1929, *Snowden* 1404.

KENYA. Rift Valley Province : Kitale, 4.3.1931, *Scott Agricultural Laboratories* (Nairobi) 1976 ; 7.3.1931, 1994 ; Tilney's Farm, 15 miles S.W. of Kitale, 27.8.1948, *A. Bogdan* 1879 ; Eldoret District, Ol Dane Sapuk, 18.7.1951, *Williams* 274 ; Solai, 9.1925, *McDonald* 982. Nyanza Province : South Kavirondo District, Kochia, 14.6.1925, *Spranger* 47 ; Kitutu, 5.8.1925, *Spranger* 63 ; Sotik, Kibajet Estate, 12.9.1949, *Bally* 7458. Central Province : Embu District, *Butler* 114 & 147 ; Nairobi District, Kabete, 20.8.1947, *Bally* 5235. Southern Province : Mara Masai Reserve, Telek River, 58 miles S.W.S. of Narok, 14.9.1947, *Bally* 5339.

TANGANYIKA. Lake Province : Karagwe, 1862, *Speke & Grant* 485 ; Mwanza District, 26.2.1932, comm. *Marshall* s.n. ; Mwanza, 1925, Davis 22 ; Mbarika, Mitego, 9.2.1952, *Tanner* 1149 ; Kwimba District, comm. *Marshall* 11. Northern Province : Rift Valley, Sino, 10.1925, *Haarer* 21A. Kilimanjaro, Mashami, Fau, 2.1928, *Haarer* 1021 ; Chagga District, Moshi, 6.1927, *Haarer* 763. Tanga Province : Korogwe District, Magemga Estate, 3.6.1953, *Faulkner* 1191. Western Province : Ujiji, 3.1939, *Loveridge* 689 ; Unyamwesi District, near Tabora, *Speke & Grant* (with) 485 ; Kalinwa, near Tabora, 1949–51, *Ramazani Shabani* (comm. *Bullock*) s.n. Rungwe District, 12.3.1932, *Davies* 7. Kondoa District, Sambala, 28.3.1929, *Burtt* 2040 ; Central Rukwa, Kafukola, 19.2.1954, *Siame* 388. Central Province : Nyaturi District, Singida, 20.3.1930, *Musk* H5/30/9 ; Kaguru District, Mpwapwa, 22.5.1930, *Hornby* 220 ; Dodoma District, Mwitikira, 16.8.1928, *Greenway* 782 ; Morogoro District, Uluguru Mts., Bunduki, 26.1.1935, *Bruce* 656 ; 20.3.1953, *Drummond & Hemsley* 1734 ; Kitundu, 25.3.1935, *Bruce* 948 ; East Uluguru Mts., 24.4.1930, *Hill* H4/30/5 ; Kipera, near Kilosa, 18.2.1926, *Burtt* 150. Southern Highlands Province : Iringa District, Iringa, 15.5.1935, *Emson* 474 ; Theme, 12.10.1936, *McGregor* 14 ; Benna District, Njombe, 1931, *Emson* 87. Southern Province : Rungwe District, Kyimbila, *Stolz* 634 ; Songea District, about 11 km. W. of Songea, 11.2.1956, *Milne-Redhead & Taylor* 8675 ; Mwera Plateau, Lindi, 4.1928, *Brand* 80.

NYASALAND. Northern Province : Ekwendeni District, Mzimba, 1937, *Wilson* 2. Central Province : road from Kotakota to Sani, 1.10.1950, *Jackson* 195. Southern Province : Zomba, 1936, *Cormack* 6, 37, 57 & 88 ; Zomba Mtn., Chaŵe Plateau, 2.4.1934, *Lawrence* 158.

NORTHERN RHODESIA. Northern Province : Abercorn District, Chilongowelo Drive, 26.2.1952, *Richards* 852 ; 30.3.1952, *Richards* 1337. Western Province : Mwinilunga District, Matonchi Farm, *Paterson* (comm. *Milne-Redhead*) M.11A ; Ndola, 1933, *Duff* 114 ; Broken Hill, 3.1936, comm. *Government School* 16 ; near Mumbwa (15° S., 28° E.), 1911, *Macaulay* 1 & 66 ; Chilanga District ; Quien Sabe, 8.1929, *C.I. Sandwith* 39 ; 17.9.1929, *C.I. Sandwith* 167. Southern Province : Mazabuka, 1.1932, *Trapnell* 781 ; Mapanza Mission, 14.2.1954, *Robinson* 527.

Southern Rhodesia. Mazoe District, 1912–13, *Mundy* s.n. ; Mazoe, 3.1920, *Rowland* 2484 ; 4.1920, *Winter* 2316. Salisbury District, 1912–13, *Mundy* s.n. ; Salisbury, 3.3.1909, *Craster* 36 ; 3.1920, *Rowland* 2484 ; 7.4.1920, *Roberts* 2505 & 2518. Lomagundi District, Trelawney, 1.3.1938, *McGregor* 25/38. Hartley District, Poole Farm, 8.2.1944, *Hornby* 2302 ; Gatooma, Cotton Station, 3.1945, *McKinstry* 8. Mashonaland : Inyanga District ; 1912–1913, *Mundy* s.n. ; 8 km. from Inyanga to the River Inyanori, 1930–31, *Norlindh & Weimarck* 4629. Nyamandhlovu District, Umgusa Spur, 7.2.1931, *Pardy* 14 ; K. Sands, 1.4.1931, *Pardy* (comm. *Burtt-Davy*) s.n. Insiza District, Insiza, 3.1920, *Capstick* 2327. Bulawayo District, Essexvale, Martin's, 2.1949, *Davies* 148. Bulawayo and Matopo Hills, *Appleton* 25 ; Matobo District, Matopos Research Station, 8.2.1954, *Rattray* 1580. Without locality, 17.5.1909, *Allen* 738.

Portuguese East Africa. Lourenço Marques : Delagoa Bay, 1822, *Forbes* s.n.

South West Africa. Waterburg Plateau, 12.1935, *G. Boss* s.n. (Herb. Trans. Mus. No. 35114).

South Africa. Transvaal : Hammanskraal, 16.1.1894, *Schlechter* 4192 ; Pretoria, *Appleton* 17 ; Johannesburg, 25.3.1918, *Moss* 6848A ; *E.S.C.A. Herb.* 307. Orange Free State : Bloemfontein, Floradale Farm, 17.8.1918, *Potts* 2898 ; Rooipan, Luckhoff, 5.1943, *Henrici* 3586. Basutoland : Leribe, *Dieterlen* 226. Natal : without precise locality, *Gerrard* 694 ; Mapumulo, 11.1875, *Buchanan* 181 ; Durban, 6.1874, *Buchanan* 14 & 33 ; Berea, 3.1896, *Medley Wood* 5996. Cape Province : Hay Division, Blackridge, 3.1934, *Wilman* 3053 ; Barkly West Division, Newlands, 1949, *Wilman* H.K. 2 ; Kimberley, Public Gardens, 3.1944, *Wilman* s.n. ; 4.1946, *Wilman* H. K. 3 ; Prieska, 1–16.4.1931, *Bryant* 617 ; 2.1934, *Bryant* s.n. ; Tembuland, Bazeia, *Baur* 408 ; Komgha Division, Kei River, 1840, *Drege* s.n. (= 4295 in Fl. Cap.) ; Grahamstown, *MacOwen* 1357 ; near Capetown, 12.1894, *MacOwen* 1566 ; Cape Peninsula, between Lansdown Road and Kenilworth, 4.4.1897, *Wolley Dod* 2448.

British Isles. Yorkshire : Bradford, 27.9.1917, *Cryer* s.n. Worcestershire : Evesham Sidings, 15.10.1955, *Goodman & Lousley* W.102 ; Pinvin, 15.10.1955, *Lousley & Goodman* W.133 ; 3.9.1955, *C. M. Goodman* 446 (W.175) ; 11.1955, *Bannister* L. Bedfordshire : Flitwick, 16.10.1949, *Dony* s.n.

Sweden. Skane : Lackalanga, 3.9.1925, *Blom.*

Germany. Rheinland : Kettwig, Wallplatt, 8.1931, *Kruger.*

Cultivated Material

France. Paris, Jardin de Plantes, 23.10.1955, *Herb. J. Gay.* This specimen, which bears the name *Eleusine figarei* Delile, was presumably cultivated from seed collected by Figari in the Sudan. The name is listed by Delile without description in Index Seminum, Horti Regii Botanici Monspeliensis, p. 3, 1847.

Wales. Aberystwyth, Plant Breeding Station, seed from Uganda cultivated for chromosome count (2n = 36), 1951, comm. *Thomas* 1/1953 ; seed from South Africa, Cape Province, Kimberley (*Wilman*), cultivated for chromosome count (2n = 36), 1951, comm. *Thomas* 1/1953.

Comparison of Diagnostic Features between *Eleusine indica* (L.) Gaertn. and *Eleusine africana* Kennedy-O'Byrne.

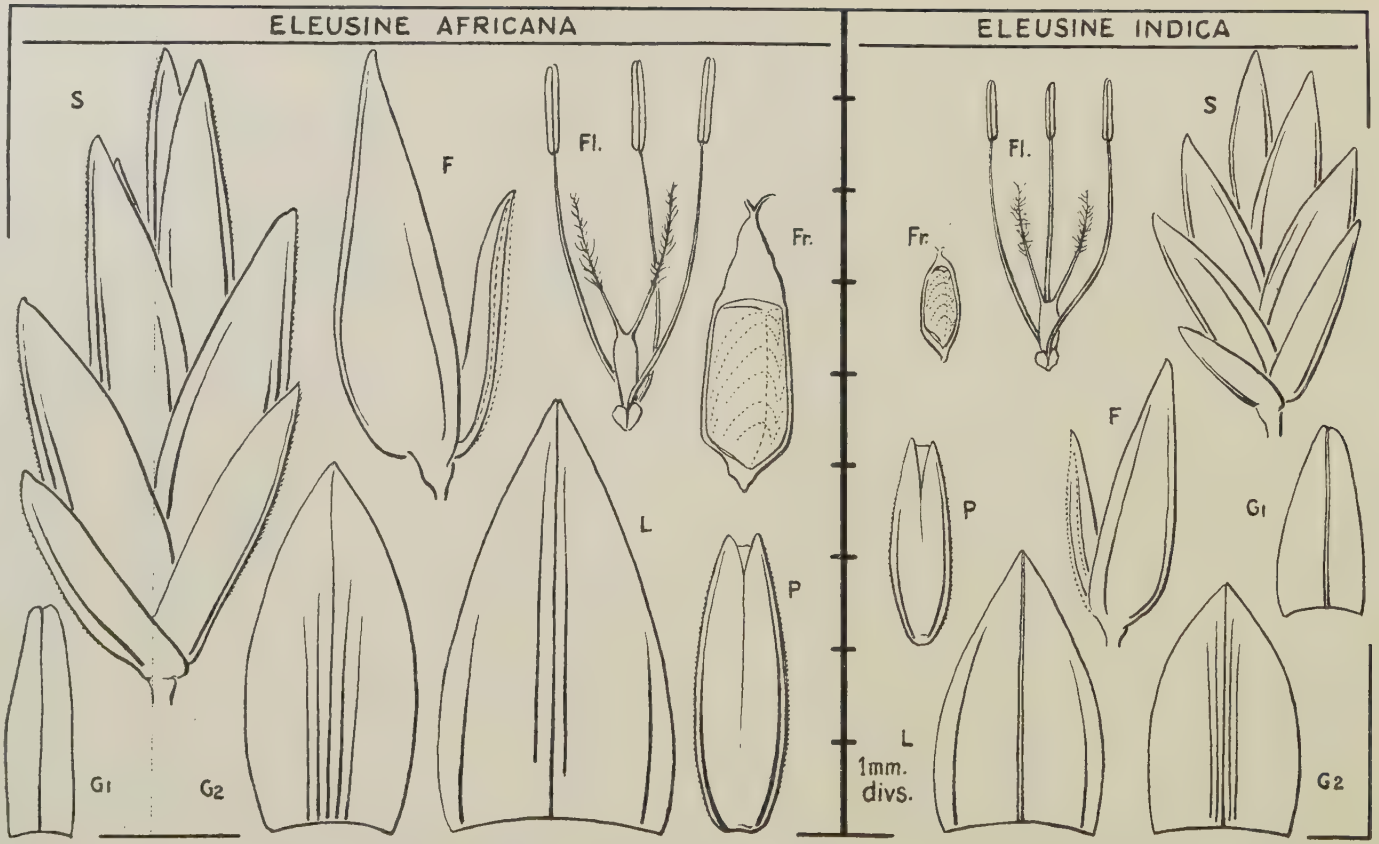
1. Chromosome Complements.

Eleusine indica is a diploid with a somatic chromosome number of 18, as determined by N. P. Avdulov, 1931, and confirmed by E. K. Janaki-Ammal in 1945. On the other hand, *Eleusine africana* is a tetraploid with a somatic chromosome number of 36, as determined by A. A. Moffett & R. Hurcombe, 1949 (sub *E. indica*) and P. T. Thomas (in litt.) in 1953.

2. Morphological Features.

As one might expect in closely related diploid and tetraploid species, the diagnostic differences are, as indicated in the following table, mainly differences in size, e.g. width of rhachis, size of spikelet, presence or absence of a wing on the lower glume and, most important of all, the length of the lemma.

	Eleusine indica (2n = 18)	Eleusine africana (2n = 36)
Height of Plant ...	(8–) 30–45 (–90) cm.	(15–) 30–90 cm.
Basal internode of culm	slender, rarely more than 5 cm. long × 3·5 mm. wide.	stouter, longer, up to 18 cm. long × 7·0 mm. wide.
Leaf-blade ...	shorter, up to 17 cm. long × 4 mm. wide.	longer, up to 50 cm. long × 1·0 cm. wide.
Spike	2–12 cm. long × 3–4 mm. wide.	6–15 cm. long × 4–6 mm. wide.
Rhachis (width at base)	0·5–1·0 mm.	1·5–2·0 mm.
Spikelet	4–5 mm. long × 2–2·5 mm. wide.	6–7·5 mm. long × 3–4 mm. wide.
Florets (number per spikelet)	(3–) 4–5 (–6)	(3–) 4–6.
Lower glume ...	(1·5–) 1·8–2·3 (–2·5) mm. long, narrowly oblong in profile, oblong to an obtuse apex when opened out, obscurely winged on the keel, 1-nerved.	(2–) 2·5–3·0 (–4·0) mm. long, narrowly lanceolate-oblong in profile, lanceolate-oblong to an acute shortly bifid apex when opened out, broadly winged on the keel, 1–3-nerved.
Upper glume ...	2·0–2·5 (–3·2) mm. long, oblong in profile, elliptic to a shortly mucronate apex when opened out.	(3·5–) 4·0–5·0 (–5·2) mm. long, lanceolate-oblong in profile, elliptic-oblong to a mucronate apex when opened out.
Lemma ...	2·7–3·0 (–3·5) mm. long, obliquely lanceolate-oblong in profile, ovate-lanceolate to an acute apex when opened out, 1-nerved or obscurely 3-nerved.	(3·5–) 4·0–5·0 mm. long, obliquely lanceolate in profile, ovate-oblong to an obtuse apex when opened out, 1-nerved or usually obscurely 5-nerved.
Palea	2·0–2·5 mm. long × –0·8 mm. wide, lanceolate-oblong between the keels when flattened, with obscure wings along the keels.	3·0–4·0 mm. long × –1·2 mm. wide, elliptic-lanceolate between the keels when flattened, with conspicuous wings along the keels.
Lodicules ...	0·25 mm. long × 0·25 mm. wide.	usually twice as large.
Ovary	0·5 mm. long.	1·0 mm. long.
Stigmas	0·75 mm. long.	1·0 mm. long.
Anthers	0·5–0·75 mm. long.	0·8–1·0 mm. long.
Fruit	1·6–1·8 mm. long × 0·5–0·8 mm. wide.	2·0 mm. long × 1–1·3 mm. wide.
Seed	1–1·3 mm. long × 0·5 mm. wide, lanceolate, acute at base and apex.	1·3–1·5 mm. long × 0·8 mm. wide, ovate-oblong, truncate at base and apex.



Eleusine africana & E. indica : S, spikelet ; G1, lower glume ; G2, upper glume ; F, floret ; L, lemma ; P, palea ; Fl, flower ; Fr, fruit. All dissections × 12.

3. Geographical Distribution, Altitudinal Range and Habitat.

	Eleusine indica	Eleusine africana
World Distribution	Widespread throughout the tropical regions of the world, established in warm temperate areas and occurring as an adventive as far north as the British Isles and south as far as New Zealand, extending approximately from latitudes 55°N. to 45°S.	Recently found as an adventive in the British Isles (introduced with wool from South Africa) and Sweden ; otherwise no known distribution outside of Africa.
African Distribution	Within the limits of the tropics from the Cape Verde Islands, through the territories of N.W. Tropical Africa, French Sudan and Niger Colony and the countries of the Guinea coast, eastwards to the southern part of the Sudan and south to Angola, Bechuanaland, S. Rhodesia and Portuguese East Africa to the Tropic of Capricorn.	Extending from within the Tropics through the territories of N.W. Tropical Africa, eastwards to the territories of N.E. Tropical Africa (Sudan, Eritrea, Somaliland and Abyssinia) and south to Cape Peninsula in the Union of South Africa.
Altitudinal Range	Occurring within a lower range, extending from sea-level up to about 5,000 ft. (infrequently up to 6,000 ft.).	Occurring within a higher range, usually extending from 3,000 ft. (infrequently from as low as 1,000 ft.) up to 7,000 ft.
Habitat	A wayside weed, along roads and paths, and around settlements and native habitations.	A weed of cultivations and along waysides. In Uganda, usually found as a weed in fields of *Eleusine coraçana* where it occurs in certain seasons in great abundance and seriously reduces the yield of the cereal crop.

Relationship of *Eleusine coracana* (L.) Gaertn. to *E. indica* (*L.*) *Gaertn* and *E. africana* Kennedy O'Byrne.

Following Körnicke (1885), it has generally been agreed that the widespread diploid annual species, *Eleusine indica* (L.) Gaertn., is the ancestral form of " Ragi " or " Coracan " and " Tocussa ", the cultivated Afro-Asiatic cereal, *Eleusine coracana* (L.) Gaertn. but, with the discovery of this new African species, *Eleusine africana* Kennedy O'Byrne, other theories concerning its evolution may well be postulated.

Like other widespread cereals, *Eleusine coracana* comprises a large series of varieties and strains of which the local Asiatic and African races have been extensively investigated though, at present, the species as a whole has not been studied comprehensively.

Examination of the material in the Kew Herbarium shows that many specimens of the cereal from tropical Asia and Africa more closely

resemble *E. indica* whilst others, from the highlands of Africa, bear a more distinct resemblance to *E. africana*. This similarity between these wild and cultivated taxa seems to be mainly due to differences in the sizes of the florets : *E. indica* and its *E. coracana* associates having smaller florets than the other pair. On this account, one might be inclined to suggest that these two types of *E. coracana* had separate origins : the Afro-Asiatic type being derived from *E. indica*-like ancestors whilst the purely African type originated from *E. africana* stock.

Alternatively, another and, perhaps, a more acceptable theory would be the derivation in the first place of *E. africana* from *E. indica* by chromosome doubling and, secondly, the selection of large grain mutants from *E. africana* for use as food, leading to the subsequent cultivation and development of the cereal, *E. coracana* (sensu lato). Evidence in support of this theory may be based on the fact that a wide range of intermediates has been found by Mr. W. Hirst in Uganda where *E. africana* occurs as a weedy contaminant in fields of the cultivated cereals. It seems quite reasonable to suppose that these intermediates are the products of hybridisation between the two tetraploids, *E. coracana* and *E. africana*. If *E. africana* should prove to be the ancestral state of *E. coracana* then, as the wild tetraploid has never been found in Asia, one would naturally suppose that the cereal plant originated in N.E. Tropical Africa. This supposition is not so unlikely when one realises that most of the wild species of this genus are indigenous to this area.

Such theories as outlined above are, of course, purely tentative and it is only from more extensive cyto-genetical and field studies that our knowledge of the origin of these cultivated cereals will be known more exactly.

Summary

1. *Eleusine africana* Kennedy O'Byrne is described as a new species from tropical and South Africa.
2. Enumeration of specimens of *E. africana* in the Kew Herbarium.
3. Comparison between *E. africana* and *E. indica* (L.) Gaertn. in respect of their morphology, cytology, geographical distribution, altitudinal range and habitat.
4. Discussion on the relationships of the cultivated cereal, *Eleusine coracana* (L.) Gaertn. and its allied species, *E. africana* and *E. indica*, with suggestions on the origin of the cereal plant.

Bibliography

Avdulov, N. P., 1931. Bull. Appl. Bot. Leningrad, Suppl. 44 : 176.

Darlington, C. D. & E. K. Janaki-Ammal, 1945. Chromosome Atlas of Cultivated Plants.

Darlington, C. D. & A. P. Wylie, 1955. Chromosome Atlas of Flowering Plants.

Körnicke, F. & H. Werner, 1885. Handb. Getreidebaues, 1 : 316–330.

Moffatt, A. A. & R. Hurcombe, 1949. Heredity, 3 : 369–373.

THE APPLICATION OF THE GENERIC NAME ACHYRANTHES.

A. A. Bullock

Under the above title, Standley published an article in 1915* in which he reported that he was much surprised to find that the type-species of *Achyranthes* is *A. repens* Linn., a plant now referred to *Alternanthera* Forssk. On the basis of this " discovery ", Standley made a great number of new combinations. In his more recent works, Standley appears to have adopted *Achyranthes aspera* Linn. as the type-species of the genus, which makes all his former new combinations redundant and returns to the position adopted by most modern authors. *Achyranthes aspera* Linn. was nominated by Hitchcock (Prop. Brit. Bot. 135 : 1929) as " standard species " of *Achyranthes* Linn., but he did not, as is required by the Rules, show that Standley's earlier selection of a lectotype should be superseded. This has led to the necessity to list " *Achyranthes* Linn. p.p. " twice in the last two Supplements to *Index Kewensis*.

Standley based his conclusion on the American Code, under which he worked, and consequently adopted its typification rule.** Linnaeus cited five species in the *Species Plantarum* (ed. 1, 1753), one of them being the " *Achyracantha* " of Dillenius, which was figured on tab. 7 of the *Hortus Elthamensis*. The same citation was given by Linnaeus following the name *Achyrantes* [sic] in the fifth edition (1754) of his *Genera Plantarum*. Standley went on to state that Linnaeus' generic description agreed with the Dillenian plant and the latter must therefore be regarded as the type of *Achyranthes* Linn.

Dillenius' name was specific, not generic, and the plant figured is in fact *Alternanthera repens* (Linn.) Kuntze. The agreement with the description of *Achyranthes* is not so exclusively close as Standley indicated, for the description is equally applicable to *Achyranthes aspera* Linn., and to some extent also to each of the other three species first enumerated by Linnaeus.

Modern methods of typification demand that all available evidence be taken into account when selecting types and it happens that this is fairly easy to find in this case. In the second edition of the *Species Plantarum* (1762) Linnaeus transferred the *Achyranthes repens* of the first edition, together with the Dillenian citation, to *Illecebrum*, with the name *I. achyracantha* Linn., but in the *Genera Plantarum* ed. 6 (1764) the description of *Achyranthes* remained the same. Linnaeus, however, neglected to delete the Dillenian citation !

It is clear that *Achyranthes*, in the mind of Linnaeus, cannot have been typified by *A. repens* since he himself excluded it from the genus. This left four of the original species and at different times three more of them have been transferred to other genera. The complete list is as follows :—

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* Standley, P. C. in Journ. Washington Acad. Sc. **5** (3), 72–76 (1915).
Bull. Torrey Bot. Club, **34, 167–178 (1907) ; Canon 15 (e).

Sp. Pl. (1753)	Sp. Pl. ed. 2 (1762)	Later*
1. *Achyranthes aspera*	*Achyranthes aspera*	*Achyranthes aspera* Linn.
2. *Achyranthes lappacea*	*Achyranthes lappacea*	*Pupalia lappacea* (Linn.) Juss.
3. *Achyranthes lanata*	*Achyranthes lanata*	*Aerva lanata* (Linn.) Juss.
4. *Achyranthes repens*	*Illecebrum achyracantha*	*Alternanthera repens* (Linn.) Kuntze**
5. *Achyranthes corymbosa*	*Achyranthes corymbosa*	*Polycarpaea corymbosa* (Linn.) Lam.

It is thus clear that a number of authors have contributed to the implicit selection of *Achyranthes aspera* as lectotype of the generic name, by the gradual exclusion of the other elements originally included in it, and Hitchcock's (1929) choice must supersede Standley's (1915).

* Not necessarily the correct names of the taxa concerned.
**The combination was originally published in synonymy by Steudel, Nom. Bot. 34 (1821).

Ferns of Malaya.*—Prof. Holttum's second volume of his Malayan Flora is devoted to the ferns. Like its predecessor on Orchids it is both an enumeration and a critical study. The book contains descriptions of approximately 500 species and is lavishly illustrated with several hundred excellent line drawings prepared by the author. There are chapters on classification, nomenclature and the ecology of Malayan ferns in particular and keys are provided to assist in identification. A feature which may interest the academic botanist is a supplement with illustrations by Prof. I. Manton on the cytology of 100 Malayan species.

The classifications adopted is that already proposed by the author in earlier papers. Apart from his own individual conceptions of family names and their limitations which often differ from those of Copeland, several of the generic names adopted by Holttum appear in Copeland's Genera Filicum merely as synonyms. The reason for this is understood by the specialist but is likely to confuse the student by whom Copeland's work is now regarded as a standard.

The great value of Prof. Holttum's work lies in the observations and discussions accompanying the formal descriptions. Based on an intimate knowledge of Malayan ferns extending over a long period they constitute a commentary of absorbing interest. Further volumes of the Malayan Flora will certainly be awaited with the keenest anticipation.

F. Ballard.

*Flora of Malaya II. Ferns of Malaya. By Prof. R. E. Holttum, pp. iv + 643, 362 fig., 3 pl. Government Printing Office, Singapore. 1954 (1955). $20 Malayan.

NOTES ON MIMOSOIDEAE : III.

J. P. M. Brenan

All cited specimens are, unless otherwise indicated, in the Herbarium of the Royal Botanic Gardens, Kew.

Various new taxa are described in the following paper. Their descriptions are drawn up from all the material of each taxon available to me, but information based only on specimens other than the holotypes is enclosed within square brackets. This is an attempt to put into practice a suggestion first made to me by my colleague, Mr. J. B. Gillett, to whom I am also grateful for much information and advice based on his intimate knowledge of many acacias in the field.

Acacia zanzibarica (*S. Moore*) *Taub.* in Pflanzenw. Ost-Afr. **C,** 195 (1895).

Normally, over much of its range, *A. zanzibarica* is easily recognised by its " ant-galls ", its yellow flowers and its broad leaflets with raised venation. However a few specimens have been collected, which must be included under *A. zanzibarica* in a wide sense, but whose leaflets are unusually small and lack the raised venation of the type. They come from localities which are apparently the most northerly outposts of the range of the species, from districts in which typical *A. zanzibarica* is not known. The final taxonomic status of these plants is still a matter of opinion, but they are sufficiently distinct to merit at least varietal separation, and this is proposed here.

Acacia zanzibarica (*S. Moore*) *Taub.*

var. **zanzibarica**

Foliola 2–6 (–9) mm. lata, venis praesertim subtus prominulis.

Habitat in Kenya et Tanganyika.

Acacia sennii Chiov., Fl. Somala **2,** 200 (1932) is synonymous with *A. zanzibarica* var. *zanzibarica.* The syntypes, preserved at Florence, *Senni* 115 and 434, both from Somalia, I have examined through the courtesy of Prof. R. E. G. Pichi-Sermolli.

var. **microphylla** *Brenan*, var. nov.

Foliola 0·5–1·5 mm. tantum lata, plerumque costa solum subtus prominula.

Ethiopia. Bogolmagno, 305 m., 23 Sept. 1953, *Bally* 9309 :—common tree to 4 m. high ; bark brownish-yellow ; soil rocky, much eroded. Ogaden, reserved area, 885 m., 20 Oct. 1954 (fl.), *Bally* 10129 :—fairly local in depression in *Commiphora* association ; bark powdery, yellow-green.

Somalia. Near Belet Wein, 2 Nov. 1952 (fl., frt.), *Hemming* 88 (K, EA) :—tree 6 m. high or bush 2 m., in mixed acacia bush. Near Bardoa, 2 Nov. 1953 (fl.), *Popov* 1052 (BM) :—black soil ; common low spiny shrub. 35 km. N.W. of Kisimayo, 55 m., 27 Jan. 1954 (frt.), *Bally* 9507 :—on black soil, occasionally dominant ; stem straight, green, with rusty-red fluff on surface ; branches almost horizontal ; flowers yellow.

Kenya. District uncertain : " Nzui District [Kitui District], also common Sabena, Lorian Swamp," 550 m., 23 Dec. 1942 (old fls.), *Bally* 1967 :—vernacular name (Kamb.) " modzewa ". Northern Frontier District : Wajir, 24 Dec. 1943 (fl.), *Bally* 3732 :—small tree in scrub. Turbi, 38° 22′ E., 3° 18′ N., 850 m., 11 Sept. 1952 (fl., frt.), *Gillett* 13803

(K, holotypus varietatis, EA, isotypus) :—foot of granite hill, edge of lava open plain ; stunted, flat-topped tree about 3–4 m. tall ; bark whitish ; flowers golden-yellow ; 2 or 3 trees in flower.

A specimen, *Hemming* 87, Kenya, Meru District, Isiolo, a tree to 5 m. in mixed bush with *Acacia tortilis* dominant, 20 Nov. 1952 (K !, EA !), is apparently *A. zanzibarica* and may well, from its locality, be var. *microphylla* ; it consists, however, of a twig bearing only very young leaves and inflorescences and its identity is thus uncertain, especially as no other specimens with which it could be matched have been collected at Isiolo.

Acacia erythrophloea *Brenan*, sp. nov. ; *A. pseudofistulae* Harms affinis, cortice ramulorum vetustiorum intense ferrugineo, spinis stipularibus multo brevioribus nunquam incanis praeter eas ramulorum perjuvenilium differt.

Arbor parva, usque ad 3 [–4] m. alta. *Ramuli* juveniles brunneo-purpurascentes, brevissime incano-puberuli, vetustiores lignosi, epidermide desquamato, strato pulverulento intense ferrugineo obtecti. *Spinae* stipulares geminae, fere rectae, eae ramulorum perjuvenilium graciles, albidae, plerumque 1–2 cm. longae, basi circiter 1 mm. diametro, eae ramulorum vetustiorum validiores sed satis breves, 0·3–1·5 cm. longae, nigrae, haud nitidae, basi circiter 2 mm. diametro, interdum basi in tumorem lignosum nigrum saccatum vel rotundatum 1–2 cm. diametro confluentes. *Folia* : petiolus brevis, 3–5 mm. longus, more ramulorum juvenilium vestitus, apice, apud par infimum pinnarum, glandula 0·5–1 (–1·5) mm. diametro ornatus ; rhachis saepius 2–8 [–13] cm. longus, ut petiolus incano-puberulus, inconstanter glandulosus, glandulis inter pinnas plerasque vel fere absentibus ; pinnae 6–24 [–31]-jugae, in uno ramulo maturo variabiles sed folia aliquae semper multijuga, 1–1·7 [–2·9] cm. longae ; foliola saepius 14–22 [–31]-juga, lineari-oblonga, 2–2·5 [–3] mm. longa, circiter 0·75 [–0·9] mm. lata, apice acuta vel subacuta, praesertim basim versus ciliolata, aliter glabra, [nonnunquam omnino glabra], costa basi margine antico propiore superne subcentrali, nervis lateralibus subtus prominulis ; folia ramulorum perjuvenilium saepe reducta, pinnis 4- usque multijugis, foliolis usque ad 3·5 mm. longis et 1 mm. latis apicem versus nonnunquam paulum latioribus. *Flores* capitati, pedunculis ex ramulis lignosis fasciculatim exorientibus, 1–3·5 cm. longis, plus minusve puberulis, involucellis basalibus. *Bracteolae* plus minusve rhombicae, ciliolatae, medio sursum curvatae, 0·75 mm. longae. *Calyx* 1 [–1·5] mm. longus, praesertim in lobis 5 minutis puberulus [vel ciliolatus]. *Corolla* tubulosa, 3 mm. longa, in lobis 5 brevibus 0·5 mm. longis extra puberula [vel ciliolata]. *Staminum filamenta* 6–7 mm. longa. *Antherae* 0·2 mm. latae, saltem aliquae alabastro glandula caduca ornatae. *Ovarium* sessile, glabrum, 1 mm. longum, 0·5 mm. latum. *Stylus* glaber, circiter 5 mm. longus. [*Legumina* (ea spec. *Jackson* 34, 44 descripta sed fortasse nondum matura) falcata, applanata, brunnea, minutissime incano-puberula, subtiliter et longitudinaliter nervosa, basi apiceque attenuata, 2·5–6 cm. longa, 4–8 mm. lata ; semina haud matura].

Tanganyika. Tabora District : S.E. Tabora, between Kipanga and the Uruwa R., 1220 m., 10 Oct. 1934 (ft.), *C. H. N. Jackson* 34 (BM) :—heavy clay soil mbuga ; gregarious, to 4 m. ; bark a remarkable red-brown ; common throughout S. Tabora. Near Kakoma, 1160 m. ?, Feb. 1934, *C. H. N. Jackson* 43 (K, BM) :—in areas of country flooded by rains ; small trees to 4 m., gregarious in habit, with remarkable red-coloured

powdery bark, locally common. At Kakoma, 1130 m., Aug. 1934 (fl., frt.), *C. H. N. Jackson* 44 :—seasonally flooded areas in the great *Brachystegia* belt ; flowers white, not cream as in *A. pseudofistula* ; also much smaller ; fruits more delicate and slender. Kakoma, 65 miles S. of Tabora, 1070–1220 m., Apr. 1935, *Lindeman* 129 (BM) :—heavy alluvium ; small tree ; bark peeling to show plum-coloured layer. S. Tabora, Oct.–Nov. 1937, *Lindeman* 367 (BM, EA) :—small tree in semi-mbuga in miombo. Kakoma, 10 Aug. 1938, (fls.), *Glover* 186 (K, holotypus, EA, isotypus) :—small slender upright tree to 3m., common constituent of stands in heavy clay mbuga soil : vernacular name " ilula ". Tabora–Ugalla road, ½ mile S. of Kakoma, 24 June 1949 (fl.) *Greenway & Hoyle* 1037 :—small, stiff-branched tree with red powdery bark on young parts, blackened below (by fire) and cracking off in transversely rectangular scales, brick-red all over when not burnt.

A. erythrophloea is akin to *A. pseudofistula* Harms, but differs in the remarkable deep purplish-brown colour of the bark layer exposed after the epidermis has fallen away, and in the shorter spines which, except on coppice shoots, are blackish and not whitish or ashen. The other differences in flower and fruit given in the field-notes to *Jackson* 44, I cannot check with the material available ; in particular, I have not seen fully mature pods of either *A. erythrophloea* or *A. pseudofistula.*

The pods of *A. erythrophloea* are curved into a shape like the letter C. The range of length given in the description is calculated as if a line were drawn along the centre of the pod from base to apex and then straightened out and its length measured.

A. erythrophloea is no doubt the " new species of gall-acacia " discussed by B. D. Burtt in Journ. Ecol. **30,** 98, 143 (1942). On p. 98 there is the following : "The heavy clay ' mbugas ' [of Tabora District] are usually waterlogged for several months in the rainy season, and support a new species of gall-acacia probably related to *Acacia formicarum*, and like it flowering in the dry season. This gall-acacia has very long leaves of a rich dark green colour, contrasting with the deep purply brown of the younger branches. The galls support paired stumpy thorns which are never silvery (as they are on the other gall-acacias) except in quite young coppice. In the north and east of the District [Tabora], *A. formicarum* dominates in the ' mbugas ', but 40 miles south of Tabora the new species replaces it as soon as the hilly country gives place to the great flat plateau ". It is clear from specimens collected and annotated by Burtt that what is called *A. formicarum* in the preceding extract is not that but *A. pseudofistula.*

The vernacular name " ilula " given for *A. erythrophloea* by *Glover* 186 is also used for other " gall-acacias ".

Acacia bullockii *Brenan*, sp. nov. ; *A. pseudofistulae* Harms et *A. erythrophloeae* Brenan affinis, saltem ab hac habitu insigne (vide infra) distat, ab ambabus foliis (var. *bullockii*) et foliolis majoribus, floribus majoribus, praesertim fructibus longioribus differt ; praeterea ab *A. erythrophloea* spinis longioribus distincta.

Arbor parva, 1–2·1 [–3] m. alta, habitu egregia ; caulibus erectis vel apicem versus paulum inclinatis simplicibus vel parum ramosis folias floresque gerentibus inter herba crebre sed singulatim exortis. *Caules juveniles* brunneo-purpurascentes, glabri [vel puberuli], validi, vetustiores nigricantes vel atrobrunnei, lenticellis crebris notati, epidermide ut videtur haud desquamante, hinc cortice haud [vel vix] ferrugineo [? an semper, vide infra]. *Spinae* stipulares geminae, rectae, primo albidae vel

albido-brunneae, postea nigricantes, plerumque 1·5–3·2 cm. longae, basi circiter 2–3 mm. diametro, basi crebre in tumorem lignosum primo purpureo-brunneum mox nigrum subrotundatum 1·2–3 cm. diametro confluentes. *Folia* pro genere magna, glabra vel rhachidibus [foliolisque] subglabris ; petiolus 4–6 mm. longus, apice apud par infimum pinnarum glandula circiter 1·5 mm. diametro ornatus ; rhachis [1·4 -] (4·5–) 10–27 cm. longus, inter paria 2–7 suprema pinnarum glandulosus ; pinnae [3–] 6-28- (? vel ultra) jugae, in uno caule variabiles sed folia plerumque multijuga, [3–] 4–8·5 cm. longae ; foliola [21 -] 36-49-juga, linearioblonga, 3–7 mm. longa, 0·75–1·4 mm. lata, glabra [vel basi margine antico ciliolata], apice acuta, costa basi margine antico propiore mox subcentrali, nervis lateralibus subtus prominulis. *Flores* ochroleuci, capitati, pedunculis ex caulibus lignosis fasciculatim exorientibus, 2–4·5 [–5] cm. longis, 1·25–3 mm. crassis, glabris [vel pubescentibus], involucellis basalibus. *Bracteolae* spathulatae, 1·75–2 mm. longae, apice sursum curvato dilatato-rotundato sparse [vel dense] ciliolato 1 mm. lato, ungue glabro [vel ciliolato] 0·2 mm. lato. *Calyx* 2·5–2·7 mm. longus, glaber [vel superne breviter pubescens], breviter quinquelobatus. *Corolla* 4·5–5·5 mm. longa, tubulosa, in lobis 5 brevibus 0·75 mm. longis divisa, glabra [vel extra in lobis inconspicue pubescens]. *Staminum filamenta* 6–7 mm. longa. *Antherae* 0·25 mm. latae, saltem aliquae alabastro glandula caduca ornatae. *Ovarium* sessile, glabrum, 1–1·2 mm. longum, 0·5–0·75 mm. latum. *Stylus* glaber, circiter 5 mm. longus. *Legumina* (fortasse nondum matura) falcata, paulum applanata, vix nervosa, basi apiceque angustata, (4–) 7 [–10] cm. longa, 3–3·5 [–5] mm. lata, glabra [vel incano-puberula] ; semina haud matura.

var. **bullockii**

Caules juveniles, foliola, pedunculi, flores omnes glabri. Bracteolae apice tantum sparse ciliolatae.

Tanganyika. Buha District : Kaberi mbuga, 1160 m. (fl.), 12 Aug. 1950, *Bullock* 3144 (K, holotypus speciei) :—forming a more or less continuous outer fringe of the mbuga ; dominant grass *Hyparrhenia*, with some *Combretum*, *Piliostigma* and occasional *Kigelia* ; small tree 1–2·1 m. high, almost unbranched ; flowers cream. Mpemvi R., 1220 m., 12 Oct. 1950, *Bullock* 3144A :—the mature trees here were up to 2·4–3 m. high ; the whole mbuga to Mbogwe is covered with the same species, accompanied by *Hyparrhenia* and *Themeda*.

var. **induta** *Brenan*, var. nov.

Caules juveniles dense puberuli. Foliola basi margine antico ciliolata. Pedunculi sparse puberuli [vel dense pubescentes]. Calyx et corolla in lobis ciliolatae [vel superne extra paulum puberulae]. Bracteolae superne dense ciliolatae.

Tanganyika. Kigoma District : Tandala in Uvinza, 1130 m. ? Aug. 1935 (fl.), *C. H. N. Jackson* 117 (K, holotypus varietatis, BM, isotypus) :—locally gregarious in heavy clay seasonal swamp or flood-plain ; small tree with larger flowers and fruits than *Acacia* (*Jackson* 34) [*A. erythrophloea* Brenan] ; a stand of *Acacia burttii* near but not mixing. Same locality, Oct. 1935, *C. H. N. Jackson* 117A (fruits only) and 117B (inflorescences only).

Acacia bullockii, at least in its typical state, is outstanding on account of its strange habit, well shown by an admirable series of photographs taken by Mr. A. A. Bullock, who has kindly allowed me to reproduce two of them here. Although the plant is most gregarious, the stems seem to

arise singly from the ground and to push their way up through the grass to a height of 2–3 metres, and yet to remain simple or with only a very few lateral branches. This habit certainly separates *A. bullockii* from *A. pseudofistula*, which is one of its closest relatives ; that of *A. erythrophloea*, which is also nearly related, is not exactly enough known for certain comparison to be made. It would be interesting to know if the gregariousness of *A. bullockii* is due to spread by rhizomes ; there is at present no evidence for or against this speculation.

A. bullockii var. *bullockii* is also easily separable from *A. pseudofistula* and *A. erythrophloea* by its exceptionally large leaves and leaflets, and by its large heads of flowers borne on stouter peduncles. Mr. Bullock's photographs show that the large leaves are usual. In addition the pods are much longer, 7–10 cm. as against 3–6 cm., the length being measured against a line running along the middle of the pod from base to apex. The pod-length of 4 cm. given in the description of *A. bullockii* is of a single and almost certainly very young pod of the holotype.

The holotype does not show the epidermis falling away to expose a vivid red inner layer, and in this differs, apparently, from *A. erythrophloea*. I have not used this character, however, as Mr. Bullock's photographs suggest that the epidermis of *A. bullockii* does at some stage fall away to expose an inner layer, about whose colour there is no evidence at present.

The status of var. *induta* is doubtful, and further material may well cause a change of opinion about it. It is clear that *Jackson* 117 shows a greater development of indumentum than in var. *bullockii*. The leaves are also, in general, smaller, with usually fewer than 15 pairs of pinnae. They are borne, however, on abnormal-looking shoots, evidently the result of very severe burning, and these differences may well be insignificant. The pods (*Jackson* 117A) are similar to those of var. *bullockii* except that some are subglabrous and others densely grey-puberulous. The isolated inflorescences of *Jackson* 117B have densely pubescent peduncles, while those of *Jackson* 117 are sparsely puberulous. It is thus not certain that *Jackson* 117, 117A and 117B are strictly homogeneous, although most probably conspecific. Also there is insufficient information about habit.

This is probably the new species of " gall-acacia " in Kigoma mentioned by B. D. Burtt in Journ. Ecol. **30,** 143 (1942).

Acacia mbuluënsis *Brenan*, sp. nov. ; ob flores extra dense indutos et tumores stipulares *A. malacocephalae* Harms affinis, sed ramulis dense pubescentibus haud puberulis, spinis praesertim in regione florifera plerumque brevibus nonnunquam tantum longis, petiolis brevibus 2–5 (haud 5–10) mm. longis velut rhachides pubescentibus nec puberulis, pinnis numerosioribus saltem foliorum majorum 15–20-jugis, foliolis margine pubescentibus nec glabris plerumque minoribus differt.

Arbor [1·2–10·5 m. alta, vertice applanato, cortice atrobrunneo]. *Ramuli* juveniles dense griseo-pubescentes, pilis 0·3–0·75 mm. longis, epidermide purpureo-brunneo fere occulto ; vetustiores obscure grisei vel nigrescentes, epidermide hic illic paulum desquamante et stratum brunneum haudquaquam pulverulentem aperiente. *Spinae stipulares*

geminae, rectae vel levissime curvatae, plerumque breves (0·4–1·0 cm. longae) praesertim in regione florifera, nonnunquam longiores et usque ad 4 cm., griseae, interdum basi in tumorem lignosum nigrum plus minusve pubescentem et rotundatum 1-2 cm. diametro confluentes. *Folia* : petiolus brevis, 2–5 mm. longus, apice glandulosus vel eglandulosus ; rhachis 2·5–3·5 [–5] cm. longus, ut petiolus pubescens, inter paria pinnarum 1–2 suprema glandulosus ; pinnae plerumque 10–16 [–20]-jugae, in una ramulo maturo variabiles sed folia aliquae ultra 15-juga, 0·8–1·3 [1·7] cm. longae ; foliola 9–12 [–17]-juga, oblonga vel linearioblonga, 2–3 mm. longa, circiter 0·75 mm. lata, apice obtusa vel subacuta, margine pubescentia, costa etiam basi subcentrali, nervis lateralibus ut videtur nullis. *Flores* capitati, pedunculis fasciculatis 1–1·5 [–2] cm. longis dense pubescentibus [vel tomentellis], involucellis basalibus [vel usque ad 3 mm. supra basim positis]. *Bracteolae* minimae, apice pubescentes, 0·5–0·75 mm. longae. *Calyx* 0·75–1·5 mm. longus, apice 1 mm. diametro, minute 5–6-denticulatus, extra dense pubescens. *Corolla* 3–4 mm. longa, extra in dimidio superiore dense pubescens vel tomentella. *Staminum filamenta* 6–7 mm. longa. *Antherae* 0·2 mm. latae, saltem aliquae alabastro glandula caduca ornatae. *Ovarium* subsessile, glabrum, 1 mm. longum, 0·5 mm. latum. *Stylus* glaber, 7 mm. longus. [*Legumina* (ea spec. *Burtt* 4271, 4937 descripta) falcata, subcoriacea, plus minusve applanata, extra dense griseo-puberula, basi apiceque acuta vel attenuata, 5–9 cm. longa, 6–9 mm. lata. *Semina* quae adsunt insectis oppugnata ; normalia nondum visa].

Tanganyika. Mbulu District : Dongobesh Valley, Basotu and Massodesh, 1680 m., 5 Sept. 1932 (fl., frt.), *B. D. Burtt* 4271 (K, BM, EA) :—in black-soil valleys following drainage, never on well-drained soils ; in the Idom Valley associated with *A. formicarum* ; tree to 10·5 m. in dense close stands over many miles of country ; flat-topped trees ; bark very dark brown, ribbed ; galls very scanty but always present : vernacular name (Kimbulu) " arabu-arabo ". Dongobesh, 1680–1830 m., 3 Oct. 1933, *B. D. Burtt* 4935 (EA). Ufana, between the rift wall and Dongobesh, 1980 m., 6 Oct. 1933 (fl.), *B. D. Burtt* 4936 (K, holotypus, BM, EA, isotypi) :—on black soil of valley-floors among rolling grass-hills ; stunted small trees 1·2–2·1 m. high, locally dominant. Ufana, 1980 m., 6 Oct. 1933 (frt.), *B. D. Burtt* 4937 (K, BM, EA) :—in black-soil valleys in rolling grass-hill country, locally dominant in dense stands ; stunted, wind-blown small trees. Moshi District : between Moshi and Engare Nairobi, about 900 m., 8 Oct. 1932 (fl.), *B. D. Burtt* 4260.

This species is related to and has been confused with *Acacia malacocephala* Harms. Under the latter name B. D. Burtt remarks (Journ. Ecol. **30,** 96 : 1942) : " a form of this community [*A. malacocephala*] appears on the south Mbulu plateau in the Northern Province, in the neighbourhood on Lakes Basotu and Basodesh." This certainly refers to *A. mbuluënsis*, since true *A. malacocephala* is not known in Mbulu District, and all the herbarium material under the latter name collected by B. D. Burtt in that area is *A. mbuluënsis*.

A. mbuluënsis differs from *A. malacocephala* in a number of ways : the young branchlets are densely pubescent with hairs 0·3–0·75 mm. long, and not merely puberulous with very short hairs 0·1 mm. long or less ; the spines are mostly short and about 0·4–1 cm. long, only occasionally longer and up to 4 cm., while in *A. malacocephala* the spines are normally 1·5–5·5 cm. long ; the petiole is shorter, 2–5 as against 5–10 mm., and, like the rhachis, is pubescent, not puberulous ; the pinnae are often more numerous and, on some leaves at least, in as many as 15–20 pairs, while in *A. malacocephala* there are only 3–10 pairs ; the leaflets of *A.*

Aeria bullockii var. *bullockii*, at Kaberi mbuga, Tanganyika. Photograph taken by Mr. A. A. Bullock on Aug. 12 1950 showing its habit, with the subsimple stems arising gregariously from the grass.

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Acacia bullockii var. *bullockii* at Kaberi mbuga, Tanganyika. Photographs taken by Mr. A. A. Bullock on Aug. 12, 1950, showing the characteristic large foliage, with "galls", flowers and young pods.

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mbuluënsis are pubescent on the margins, not glabrous, and mostly smaller, those of *A. malacocephala* being 2·5–6 mm. long and 0·8–1·5 mm. wide. True *A. malacocephala* resembles *A. drepanolobium* Harms ex Sjöstedt, while *A. mbuluënsis* gives the impression of being hairier, with rather stouter twigs conspicuously thickened under the spines, and with smaller leaves with more closely set pinnae and leaflets.

Acacia abyssinica *Hochst. ex Benth.* in Hook., Lond. Journ. Bot. **5,** 97 (1846).

There is a conspicuously flat-topped acacia which is common in certain parts of Uganda and Kenya and which has sometimes been called *A. abyssinica*, for example in Battiscombe's Trees and Shrubs of Kenya Colony, ed. 2, 70 (1936), and sometimes *A. xiphocarpa* Hochst. ex Benth., for example in Eggeling and Dale's The Indigenous Trees of the Uganda Protectorate, ed. 2, 215 (1952). This acacia proves to be rather uniform in its characters, and to extend from the Sudan Republic southwards to Nyasaland.

Type-material of both *A. abyssinica* and *A. xiphocarpa*, which has been available to me, shows marked differences in the foliage from the widespread acacia referred to above. In fact nothing exactly matching the latter has been so far collected in Ethiopia, where the types of *A. abyssinica* and *A. xiphocarpa* were originally gathered ; and conversely nothing to match typical *A. abyssinica* or *A. xiphocarpa* has so far been collected except in Ethiopia.

Bentham in Hooker's London Journal of Botany, **5,** 96–97 (1846), recognised *A. abyssinica* and *A. xiphocarpa* as separate and distinct species. Richard, Tent. Fl. Abyss. **1** (1847) described *A. xiphocarpa* as distinct, but placed *A. abyssinica* in the synonymy of *A. arabica* (Lam.) Willd. The latter view cannot of course be maintained today. Oliver in Fl. Trop. Afr. **2,** 347 (1871) merged *A. abyssinica* and *A. xiphocarpa* into one species, for which he adopted the name *A. abyssinica*, although he wrote that he did " not feel much confidence " in so doing ; this view has been followed by most authors until 1951, when Prof. R. E. G. Pichi-Sermolli, in Miss. Stud. Lago Tana, Ric. Bot. **1,** 52–4, gave reasons for considering *A. xiphocarpa* and *A. abyssinica* as distinct species, with an elaborate table of comparative characters in support.

I find that Ethiopian material of *A. abyssinica* and *A. xiphocarpa* shows considerable variation in indumentum, number and direction of pinnae, size of leaflets, and colour and direction of pods, but that they are not correlated in the constant way postulated by Prof. Pichi-Sermolli. In any event the differences do not appear very important and more likely to be varietal than specific, a possibility that he indeed admits.

It seems preferable to use *A. abyssinica* as the valid name for a single species, since this was the name adopted by Oliver when he merged, apparently for the first time, *A. abyssinica* and *A. xiphocarpa* into one, and to recognise under it two subspecies, a typical one including both *A. abyssinica* and *A. xiphocarpa* in a restricted sense, and a second subspecies corresponding to the widespread acacia referred to at the start of this note :—

Acacia abyssinica *Hochst. ex Benth.*

subsp. **abyssinica**

Acacia abyssinica Hochst. ex Benth. in Hook., Lond. Journ. Bot. **5,** 97 (1846) ; Schweinfurth in Linnaea **35,** 320 (1867–8) ; Oliv. in Fl. Trop. Afr. **2,** 347 (1871) ; Benth. in Trans. Linn. Soc. **30,** 510 (1875) ; Bak. f., Leg. Trop. Afr. 839 (1930), pro parte ; Pichi-Sermolli, Miss. Stud. Lago Tana, Ric. Bot. **1,** 52 (1951).

Acacia xiphocarpa Hochst. ex Benth. in Hook., Lond. Journ. Bot. **5,** 96 (1846) ; A. Rich., Tent. Fl. Abyss. **1,** 240 (1847) ; Schweinfurth in Linnaea **35,** 328 (1867–8) ; Pichi-Sermolli, Miss. Stud. Lago Tana, Ric. Bot. **1,** 52 (1951).

[*Acacia arabica* (non Lam.) Willd.—A. Rich., Tent. Fl. Abyss. **1,** 237 (1847), pro parte quoad syn. *Acacia abyssinica.*]

Pinnae plerumque 1·5–2·5 cm. longae. Foliola plerumque 2–4 mm. longa, 0·5–0·75 mm. lata.

The subspecies is confined to Ethiopia, so far as we know. Specimens both of *A. xiphocarpa* and *A. abyssinica* have been enumerated by Pichi-Sermolli (*l.c., supra*), and it does not appear necessary to repeat them here.

subsp. **calophylla** *Brenan*, subsp. nov.

[*Acacia abyssinica* (non Hochst. ex Benth., sens. strict.)—Dale in Battiscombe, Trees and Shrubs Kenya Col., ed. 2, 70 (1936)].

[*Acacia xiphocarpa* (non Hochst. ex Benth., sens. strict.)—Dale & Eggeling, Indig. Trees Uganda, ed. 2, 215, photo 39, fig. 48 m. (1952) ; also in ed. 1, 117 (1940) ; Brenan in Mem. N.Y. Bot. Gard. **8,** 429 (1954) as *Acacia* ? *xiphocarpa*].

Pinnae quam in subsp. *abyssinica* confertiores, 0·4–1·5 cm. longae. Foliola minima, usque ad 2·5 mm. longa, 0·25–0·4 (–0·5) mm. lata.

Belgian Congo. Haut-Katanga : Sampwe, 2200 m., Apr. 1944 (frt.), *Dubois* 1166 (K, BM). Ruanda-Urundi : Irubura, about 1700 m., 31 May 1926 (fl., frt.), *Robyns* 2401 (K, BM, EA).

Sudan Republic. Issore, 32° 50′ E., 3° 80′ N., 1675 m., characteristic of tall grass and fire-swept woodland, almost the only tree in fire-swept grass areas at this height, 9 Feb. 1929 (fl.), *Chipp* 55 :—flat-topped tree 12–15 m. high. Didinga Mtns., Nagichot, 1980 m., in open and on edge of forest, 26 Apr. 1939 (fl.), *Myers* 11147 :—occasional very flat-topped small tree : flowers white, basally red ; lower shoots thorny : vernacular name (Didinga) " iroich ".

Uganda. Karamoja District : Napak, plentiful in open from 1830–2130 m., Feb. 1938 (fl.), *Songster* 413 (K, EA) :—flat-topped tree to 12 m. ; bark dark, reddish ; calyx and corolla red. Kigezi District : Nyalusangi, Dec. 1930 (fl., frt.), *Harris* 44 (K, EA) :—flat-topped tree up to about 12 m., bark reddish-brown, fissured ; flowers white. Ruzumbura, Ruhinda, 1520 m., May 1946 (fl.), *Purseglove* 2049 (K, EA) :—tree 6 m. : vernacular name (Lukiga) " omunyinya ". Mbale District : Mt. Elgon, 1830-2130 m., common in open forest, 18 Apr. 1927 (fl., frt.), *Snowden* 1078 (K, BM, FA) :—flat-topped tree 9–15 m. high or more : vernacular names (Sabei) " kateta ", (Lugishu) " kiremba ". Mt. Elgon, Kaburon, 2070 m., *Eggeling* 2475 ; 2290 m., *Eggeling* 2488 :—flat-topped ; flowers white with red calyces.

Kenya Colony. Laikipia District : Mile 9¼, Rumuruti–Thomson's Falls road, 1950 m., *Wimbush* 3 *in F.H.* 2592 :—usually branching at 1·2 m. into several branches forming a flat top 9–12 m. from ground ; bark rough and brownish ; flowers red in bud ; stamens white. Nakuru District : Rift Valley on S. slopes of Menengai Hill, 1890 m., *Wimbush* 12 *in F.H.* 2600 : –flat-topped tree with spreading crown 6 m. high ; bark brownish-grey. Rift Valley at foot of E. escarpment E. of Nakuru, 1920 m., *Wimbush* 9 *in F.H.* 2601 :—tall clean-limbed tree 15 m. high ; flowers white. Naivasha, 29 May 1953, *Greenway & Pearsall* 8792 : –tree to 12 m., branching from 1–3 m. up with spreading

crown about 18 m. in diameter ; bark grey-brown, fissured longitudinally ; in local stands with *Acacia xanthophloea* in grassland on a brownish-grey volcanic soil. Mt. Elgon, 1980–2290 m., Mar. 1931 (fl.), *Lugard* 582 *in C.M.* 2918 (K, EA) :—spreading tree to 9 m. ; flowers cream. Mt. Elgon, 1980–2290 m., Jan. 1931 (fl.), *T. H. E. Jackson* 333a *in C.M.* 2917 (K, EA) :—9–15 m. ; flowers pinkish-white : vernacular name " marabaget ". Mt. Elgon, 2320 m., Mar. 1954 (fl.), *Mrs. Tweedie* 1157 :—bush country, especially river-beds and near forest line ; quick growing tree to 7·5 m., very markedly flat-topped ; timber soft, white and useless ; flowers cream, in balls reddish-brown at heart ; buds also reddish-brown. Kiambu District : Muguga, 2170 m., margin of evergreen forest, 29 May 1931 (frt.), *Trapnell* 2122 :—rather low-growing, flat-crowned tree. South Kavirondo District : Mugunga near Kisii, dominant in *Acacia* woodland and bushland, 1830 m., 23 Aug. 1946 (frt.), *Greenway* 7860 (K, holotypus subspeciei, EA, isotypus) :—much branched, flat-topped tree to 12 m. Lambwe Valley, July 1939 (fl.), *Lewis* 216 *in C.M.* 11306 (EA). Nyanza Basin, 1070–1520 m., in open grasslands, *Moon* 579 :—flat-topped, 7·5–12 m. high ; flowers white. Kisumu-Londiani District : Londiani, 2290 m., Apr. 1932 (fl., frt.), *R. M. Graham* 594 *in C.M.* 7020 :—common large flat-topped thorn-tree to 15 m. in favourable localities ; flowers creamy-white, scented ; buds red ; bark on old trees grey, fairly rough, on young trees and branchlets it peels off in papery opaque brittle layers, yellow in colour.

Tanganyika Territory. Masai District : S. side of Ngorongoro Mtn. at Kamsiya Nyoka, c. 1830 m., 24 Sept. 1932, *B. D. Burtt* 4285 (K, EA) (identification somewhat doubtful, as the specimen consists only of pods. Arusha District : Olmotonyi, Meru Forest Reserve, Jan. 1955 (fl.) *Athanes Beseko* 1, *Nuru Salimu* 1, *Benedict Wakuwile* 1 :—flat-topped tree ; flowers yellow : vernacular names (Kiarusha) " lyasulele ", " oldasilele ". Moshi District : Rombo, 1680 m., June 1946 (frt.), *Greenway* 9830 (EA) :—flat-topped spreading tree with rough longitudinally furrowed grey-black bark ; common on stream-banks. Songea District : Matengo Hills, Miyau, forming small colony on low hill, 1620 m., 13 Jan. 1956 (frt.), *Milne-Redhead & Taylor* 8321 :—flat-topped tree up to 15 m. ; bark rough, grey-brown, papery in young trees ; trees dropping their fruits but with no sign of flowering.

Portuguese East Africa. Niassa : Vila Cabral Div., Jessi Mtn., 27 May 1948, *Pedro & Pedrogão* 4005 (EA) :—flat-topped tree about 6 m. high ; in grassland with scattered trees and shrubs. Manica e Sofala : Macequece, 1000–1400 m., 26 Aug. 1941 (frt.), *Torre* 3183 :—tree 6–9 m. ; 2 Jan. 1948 (fl.), *Barbosa in Mendonça* 796 ; tree 15 m. ; 7 Jan. (fl.), *Mendonça* 3632 :—tree 8–12 m.

Nyasaland. Shire Highlands, *Adamson* 140. Zomba District : Zomba Plateau, 1400–1500 m., occasional in *Brachystegia* woodlands, common in second-growth rain-forest in gullies on mountain slopes, 5 June 1946 (young frt.), *Brass* 16234 :—tree to about 12 m., flat-topped.

Southern Rhodesia. Umtali, 1370 m., Sept. 1922 (frt.), *Eyles* 3532. Vumba Mts. near Umtali, Dec. 1937 (fl.), *Obermeyer* 2061 *in Herb. Transvaal Mus.* 37062.

Three specimens have been gathered in Tanganyika Territory which are close to subsp. *calophylla*, but have longer pinnae than usual (about 1·5–2·2 cm.). This may merely be due to the fact that unusually robust, perhaps juvenile, shoots have been collected, or that some other taxonomic entity such as *A. rehmanniana* is occurring ; the leaflets are too narrow and the pinnae too numerous to permit an identification with *A. abyssinica* subsp. *abyssinica* ; the material available is not enough to allow a certain decision to be made. The specimens are as follows, and more material from both localities is wanted :—

Tanganyika. Mpwapwa District : Kiboriani Mtns., 1680 m., very local in stands of two or three in open *Dombeya*, *Brachystegia spiciformis*, *Faurea speciosa*, *Acacia* woodland on a mountain top, 3 Oct. 1938, *Greenway* 5798 (K, EA) :—flat-crowned tree with ascending and spreading branches up to 21 m. high ; bark very rough, fissured, corky, dark brown, almost black ; leaves dark green. Same locality, 1680 m., 19 Apr. 1932, *B. D. Burtt s.n.* (BM) :—very tall and large, flat-topped acacia, locally common. Iringa District, Sao Highlands, 58 km. N. of Ikwera, 17 June 1938, *Pole Evans & Erens* 788 :—tree 6–9 m.

Acacia nilotica (*L.*) *Del.*, Fl. Aegypt. Ill. 31 (1813).

The wide conception of this difficult species, as so clearly explained in the valuable account by A. F. Hill in Bot. Mus. Leafl. Harvard Univ. **8,** 94–100 (1940), appears a most reasonable one. Certain comments are necessary, however. Firstly, Hill did not deal with *Acacia subalata*

Vatke and its synonymy, which is certainly conspecific with *A. nilotica* in its wide sense ; in fact *A. subalata* corresponds, apparently, with a race as distinct and as much worth recognition as the varieties of *A. nilotica* adopted by Hill. Secondly, there is a geographical variant on the Kenya coast, very distinct but hitherto neither described nor named. Thirdly, *A. nilotica* is subdivided by Hill into five varieties ; these are certainly worthy of being kept up, and apparently occupy distinct geographical ranges, although the latter have sometimes been made less so through man's deliberate planting or carriage of seeds from place to place. For entities distinct both morphologically and geographically but yet evidently conspecific the rank of subspecies is appropriate ; this, however, entails certain alterations to Hill's account, to deal with which and also the other points already mentioned this note has been prepared.

Acacia nilotica (*L.*) *Del.*

subsp. **nilotica**

A. nilotica (L.) Del. var. *typica* A. F. Hill in Bot. Mus. Leafl. Harvard Univ. **8,** 98 (1940).

A. nilotica (L.) Del. var. *nilotica* ; Cufodontis in Bull. Jard. Bot. Brux. **25,** 195 (1955).

subsp. **tomentosa** (*Benth.*) *Brenan*, subsp. et comb. nov.

A. arabica (Lam.) Willd. var. *tomentosa* Benth. in Hook., Lond. Journ. Bot. **1,** 500 (1842).

A. nilotica (L.) Del. var. *tomentosa* (Benth.) A. F. Hill in Bot. Mus. Leafl. Harvard Univ. **8,** 98 (1940) ; Cufodontis in Bull. Jard. Bot. Brux. **25,** 196 (1955).

subsp. **indica** (*Benth.*) *Brenan*, subsp. et comb. nov.

A. arabica (Lam.) Willd. var. *indica* Benth. in Hook., Lond. Journ. Bot. **1,** 500 (1842).

A. nilotica (L.) Del. var. *indica* (Benth.) A. F. Hill in Bot. Mus. Leafl. Harvard Univ. **8,** 99 (1940).

subsp. **kraussiana** (*Benth.*) *Brenan*, subsp. et comb. nov.

A. arabica (Lam.) Willd. var. *kraussiana* Benth. in Hook., Lond. Journ. Bot. **1,** 500 (1842).

A. nilotica (L.) Del. var. *kraussiana* (Benth.) A. F. Hill in Bot. Mus. Leafl. Harvard Univ. **8,** 98 (1940).

subsp. **leiocarpa** *Brenan*, subsp. nov.

Ramuli juveniles glandulis inconspicuis exceptis glabri [vel sparse puberuli vel raro densius puberuli]. Legumina haud moniliformia, oblonga, etiam juvenilia glabra vel fere glabra, [raro leviter puberula], 1–1·1 [–1·3] cm. lata, marginibus rectis vel leviter crenatis.

British Somaliland. Golis Range (frt.), *Drake Brockman* 217, 221. Hargeisa, 1310 m., 22 Sept. 1932 (buds, frt.), *Gillett* 3948 (K, EA) :—tree to 15 m., flowers yellow ; fruit going black ; fairly common on deep soil in moister spots throughout the tree

acacia formation ; camels eat its fruits, and goats, but poisonous to people ; gum no good and black : vernacular name " marah ". *Burao*, 1070 m., 26 Jan. 1944 (fl., frt.), *Bally* 3011 *in C.M.* 11838 (K, EA) and 4 Nov. 1944 (frt.) *Glover & Gilliland* 265 (BM, EA) : —occasional tree 4–6 m. high with straight trunk and spreading crown. Near Sheik, 910–1220 m., 1 Sept. 1952, *Hemming* 27 (EA) :—good-sized tree : vernacular name " marah ".

Somalia. Giuba, isola Touata ad Alessandra, Dec. 1931 (frt.), *Tozzi* 335. 33 km. N.W. of Kisimayo, 55 m., 27 Jan. 1954 (frt.) *Bally* 9505 :—on black soil, locally common ; crown rather spreading.

Kenya. Kilifi District : Malindi, 18 Aug. 1949 (fl., frt.), *Bogdan* 2612 :—scattered tree grassland, frequent ; it extends only a few miles towards Mombasa and is absent most of the way from Malindi to Mombasa ; tree 3–6 m. high with flat dense crown. Same locality, Oct. 1954 (fl.), *Mrs. Tweedie* 1248 :—bush with cultivation ; flowers yellow ; tree to 5 m. high, with trunk about 60 cm. in diameter. Mambrui (fl.), *R. M. Graham* K.83 *in F.H.* 1676 (K, EA) :—spreading tree ; bark of trunk blackish ; spines straight and 5 cm. long ; flowers bright yellow : vernacular name (Swa.) " mgunga ". Lamu District : Mambore, Jan. 1931 (fl.), *MacNaughtan* 23 *in F.H.* 2569 (K, EA) :—small tree 9 m. high ; flowers yellow and scented ; branches used for ribs of dhows : vernacular names (Swa. Lamu) " mtetewi ", (Swa.) " mjunju ". Faza, Sept. 1935 (fl., frt.), *C. W. Elliot* 3365 :—tree with mushroom-shaped crown, growing in bush on mainland and islands : vernacular names (Sw. L.) " mtetewa ", (Swa. M.) " mgunga ". Patta (Patte) Island, N. of Lamu, Oct. 1937 (frt.), *Dale* 3832 in *C.M.* 13988 (K, holotypus subspeciei, EA, isotypus) :—small tree to 7·5 m. high with rough black bark and golden globular inflorescences ; ripening fruits sticky ; common on sandy soil : vernacular name (Baj.) " mtetewe ". Patta Island, Faza, 10 Feb. 1956 (fl., frt.), *Greenway & Rawlins* 8878 :—much branched tree to 5 m. high with erect and eventually horizontal branches ; bark light brown, rough, longitudinally fissured, yellow-green when young ; flowers golden-yellow ; pods very dark brown, shining ; locally common but scattered in cultivated land : vernacular name (Kiduruma) " mgundi ". Kiunga, coast, 23 Oct. 1947 (fl., frt.), *Mrs. Adamson* 437 *in Herb. Bally* 6136 :—thorn tree ; flowers orange. Without locality, *comm. Cons. of Forests* 271 (BM).

Very distinct in its usually quite glabrous non-moniliform fruits. In its typical form, in Kenya, subsp. *leiocarpa* has glabrous or sparsely puberulous young branchlets and glabrous fruits. Similar plants also occur in Somalia, e.g. *Tozzi* 335, but further north, in British Somaliland, the young branchlets are rather densely puberulous, while the fruit may be glabrous (*Gillett* 3948) or very sparingly puberulous (*Drake Brockman* 217, 221, *Bally* 3011). *Greenway & Rawlins* 8878, from Lamu District in Kenya, resembles *Gillett* 3948 in its indumentum, however.

There is one specimen at Kew, of flowering shoots only, which appears to be subsp. *leiocarpa*, and which bears a *Battiscombe* 487 label indicating that it was collected at Nairobi at 5,600 feet. This is the only evidence for the occurrence of subsp. *leiocarpa* away from the coast in Kenya and at such an altitude, and I suspect either a false locality or that the specimen does not belong with its label.

subsp. **adansonii** (*Guill. et Perr.*) *Brenan*, subsp. et comb. nov.

A. adansonii Guill. et Perr. in Guill. Perr. et A. Rich., Fl. Senegamb. Tent. 249 (1832).

A. nilotica (L.) Del. var. *adansonii* (Guill. et Perr.) O. Ktze., Rev. Gen. Pl. **1,** 156 (1891) ; Cufodontis in Bull. Jard. Bot. Brux. **25,** 196 (1955).

A. nilotica (L.) Del. var. *adansoniana* (Dubard) A. F. Hill in Bot. Mus. Leafl. Harvard Univ. **8,** 99 (1940).

subsp. **subalata** (*Vatke*) *Brenan*, subsp. et comb. nov.

A. subalata Vatke in Oesterr. Bot. Zeitschr. **30,** 276 (1880).

A. taitensis Vatke in Oesterr. Bot. Zeitschr. **30,** 278 (1880), a doubtful synonym.

Ramuli juveniles dense pubescentes vel subtomentosi. Legumina haud moniliformia, oblonga, ubique dense et persistenter subtomentosa, saepius latiuscula (1·3–2·2 cm.), marginibus rectis vel leviter crenatis.

The holotypes of *Acacia subalata* and *A. taitensis*, *Hildebrandt* 2589 and 2591 respectively, both from Ndi in the Taita District of Kenya, appear to have been at Berlin and now to be no longer extant ; it is probable that duplicates exist, but I have so far not succeeded in finding them in other herbaria. If there are indeed none, then a neotype should be chosen, but it seems premature to do that at present.

I am interpreting *A. subalata* as referring to the most frequently occurring race of *A. nilotica* in East Africa, as represented by *A. S. Thomas* 3074 and *Eggeling* 2502 from Uganda, by *Bogdan* 1248 and *Trapnell* 2201 from Kenya, and by *Doggett* 115 and *Greenway* 2479 and 6808 from Tanganyika Territory. The identity of *A. taitensis* with *A. subalata*, judged from the description alone, seems somewhat doubtful, and further material of the complex from Ndi, the type-locality of both species, is therefore wanted.

A. nilotica subsp. *subalata* is closest to subsp. *adansonii*, differing in having usually longer, pubescent to subtomentose indumentum on the branchlets and pods, the latter having their edges usually straight or nearly so and normally a rather well-defined flattened margin 2–4 mm. wide, whence presumably the epithet.

Acacia tortilis (*Forsk.*) *Hayne*, Darst. Beschr. Arzneyk. Gebräuchl. Gewächse **10,** t. 31 (1827).

It has been generally assumed in recent years, following E. G. Baker's account of the group in Leg. Trop. Afr. 841–2 (1930), that there were two main species of the *A. tortilis* complex in tropical Africa, one with glabrous pods, usually, following E. G. Baker, called *A. tortilis*, or else *A. raddiana* Savi, the other with pubescent pods and called *A. spirocarpa* Hochst. ex A. Rich. *A. heteracantha* Burch., mainly South African, was correctly placed near these two by E. G. Baker, but though he maintained it as a species, he was unable to distinguish it from them in his key except by that last resort, a difference in geographical range. It was not appreciated that *A. heteracantha* had glabrous pods like those of *A. raddiana*, but that in other ways, notably the pubescence of the vegetative parts, it was not clearly distinguishable from *A. spirocarpa*. The maintenance of distinct glabrous- and pubescent-podded species in this group is made still more difficult by the presence in the Sudan of plants with somewhat pubescent pods but otherwise indistinguishable from *A. raddiana*. These variations are more satisfactorily treated under a single species, for which the earliest name is *A. tortilis*. The following scheme is therefore proposed. The taxa within *A. tortilis* are for the most part primarily distinguished by the indumentum of the pods, and secondarily by that of their vegetative parts.

Acacia tortilis (*Forsk.*) *Hayne*.

subsp. **tortilis**

Mimosa tortilis Forsk., Fl. Aegypt.-Arab. 176 (1775).

Acacia spirocarpa Hochst. ex A. Rich. var. *minor* Schweinf. in Linnaea **35,** 323 (1867–8).

Ramuli juveniles breviter et satis dense pubescentes. Petioli et rhachides foliorum dense pubescentes. Foliola dense ciliata. Legumina pilis patulis breviter pubescentia, 3–5 mm. lata, ut videtur eglandulosa, glandulis conspicue coloratis ut in ssp. *spirocarpa* certe absentibus.

Hab. Palestine ?, Egypt (fide Schweinfurth), Sudan Republic, Arabia and Aden.

The type of *Mimosa tortilis* Forsk., collected on April 4–5, 1763 in Arabia on " Mons Soudân prope Hás ", is in the Botanical Museum and Herbarium at Copenhagen. Through the kindness of the Director of that Institution, I have been able to examine this important and valuable specimen. It is not, as has been sometimes assumed, identical with *A. raddiana* Savi, nor with typical *A. spirocarpa* Hochst. ex A. Rich., although it does indeed have a hairy pod. It is clearly the same as Schweinfurth's *A. spirocarpa* var. *minor*, and matches exactly two specimens of this at Kew : *Schweinfurth* 601, Arabia, Badjil (Tehama), 23 Jan. 1889, and *Deflers* 336, Arabia, Yemen, Fodhli region, plain N.E. of Schughra. For further comments on the identity of var. *minor*, see below under subsp. *spirocarpa*.

subsp. **raddiana** (*Savi*) *Brenan*, subsp. et comb. nov.

Acacia raddiana Savi, Alc. Acazie Egiz. 1 (1830).

A. fasciculata Guill. et Perr. in Guill., Perr. et A. Rich., Fl. Senegamb. Tent. 252 (1832), synon. prob.

[*A. tortilis* (non (Forsk.) Hayne, sens. strict.)—Schweinfurth in Linnaea **35,** 327 (1867–8)].

A. tortilis (Forsk.) Hayne f. *raddiana* (Savi) Roberty in Candollea, **11,** 143 (1948).

Ramuli juveniles necnon folia glabra vel subglabra vel pubescentia. Legumina glabra vel appresse pubescentia, (6-) 7–9 mm. lata, eglandulosa.

var. **raddiana**

Ramuli juveniles necnon folia glabra vel subglabra. Legumina glabra.

Hab. Algeria, Egypt, Senegambia, Nigeria, Kenya.

var. **pubescens** *A. Chev.* in Bull. Soc. Bot. Fr. **74,** 960 (1927).

Ramuli juveniles necnon rhachides foliorum breviter plus minusve pubescentes. Legumina plus minusve appresse pubescentia.

Hab. Algeria, French Sudan, Sudan Republic.

The var. *pubescens* A. Chev. seems merely a variant of subsp. *raddiana* with some appressed pubescence on the pods. The application of the name to this taxon depends upon the assumption that Chevalier's plant, which lacks pods, is identical with hairy-podded gatherings from elsewhere, and the matter can only be settled when further material, with pods, is available from the type-region.

The differences between subsp. *raddiana* and subsp. *heteracantha* are discussed under the latter.

subsp. **spirocarpa** (*Hochst. ex A. Rich.*) *Brenan*, subsp. et comb. nov.

Acacia spirocarpa Hochst. ex A. Rich., Tent. Fl. Abyss. **1,** 239 (1847).

A. spirocarpa Hochst. ex A. Rich. var. *major* Schweinf. in Linnaea **35,** 323 (1867–8).

A. pappii Gandoger in Bull. Soc. Bot. France **60,** 458 (1913).

A. tortilis (Forsk.) Hayne f. *spirocarpa* (Hochst. ex A. Rich.) Roberty in Candollea, **11,** 144 (1948).

Ramuli juveniles dense pubescentes. Petioli et rhachides foliorum pubescentes. Legumina pilis patentibus vel curvatis tomentella vel pubescentia, 6–9 (–12) mm. lata, glandulis numerosis atrorubris sub lente conspicuis in pube immixtis.

Hab. Sudan Republic, Eritrea, Ethiopia, Uganda, Kenya, Tanganyika, Portuguese East Africa, Nyasaland, Northern and Southern Rhodesia, Bechuanaland Protectorate and Angola.

Isotype material of the three Schimper numbers from Ethiopia, 502, 612 and 658, cited by A. Richard under *A. spirocarpa*, is in the Kew Herbarium, as is also an isotype of *A. pappii* Gandoger (Eritrea, Beni Amer, along R. Sulet, 700 m., 8 Nov. 1906, *Pappi* 7388).

Schweinfurth, in his excellent paper in Linnaea cited above, does not mention any specimens of either var. *minor* or var. *major*. The very good illustrations together with the descriptions can leave no doubt at all of what he intended by these two, however. *Schweinfurth* 1973 and 1975, from between Atbara and the Red Sea, were both issued as var. *major* and are represented at Kew, while *Schweinfurth* 1966, from Gebel Uaratab near Suakin in the Sudan, issued as *A. spirocarpa*, corresponds excellently with var. *minor*.

A variant of subsp. *spirocarpa* with the pods clothed with long spreading hairs has been collected in Tanganyika Territory, on the Iringa Dodoma road in the Great Ruaha Valley (*Trapnell* 2156) and at 80 km. E. of Dodoma (*Willan* 26). *A. tortilis* var. *crinita* Chiov., Result. Miss. Stefan.-Paoli, **1,** 71 (1916) is a very similar plant, and the varietal name may be used to designate the specimens cited above and other such plants. The holotype of var. *crinita*, *Paoli* 907, Somalia, between Dorianle and Oneiátta, is at Florence, and I have examined it, through the courtesy of Prof. Dr. R. Pichi-Sermolli who kindly lent it. The pods of the type are very narrow and evidently immature, but are clothed with moderately dense long spreading hairs and are also glandular.

subsp. **heteracantha** (*Burch.*) *Brenan*, subsp. et comb. nov.

Acacia heteracantha Burch., Trav. **1,** 389 (1822).

Acacia litakunensis Burch., Trav. **2,** 452 (1824).

A. spirocarpoides Engl. in Engl., Bot. Jahrb. **10,** 23 (1888).

A. maras Engl. in Engl., Bot. Jahrb. **10,** 24 (1888).

Ramuli juveniles pubescentes. Petioli et rhachides foliorum etiam pubescentes. Legumina glabra vel fere glabra, (4–) 6–9 mm. lata.

Hab. Portuguese East Africa, Southern Rhodesia, Bechuanaland Protectorate and South Africa.

This, like subsp. *raddiana*, has a glabrous pod. It is distinguished from typical subsp. *raddiana* by the pubescent branchlets and leaves, and from subsp. *raddiana* var. *pubescens* by the glabrous pods.

The holotypes of *A. litakunensis* (Bechuanaland, Litakun, *Burchell Cat. Geogr.* 2205) and *A. heteracantha* (Griqualand, Springslangsfontein, between Griquatown and the Orange R., *Burchell Cat. Geogr.* 1710) are at Kew. Those of *A. spirocarpoides* (Griqualand, Kimberley, *Marloth* 839) and *A. maras* (South West Africa, Otyimbingue, *Marloth* 1260) were at Berlin, but being now presumably destroyed, the species are therefore interpreted *e descriptione*.

Acacia reficiens *Wawra* in Sitzungsber. Mathem.-Naturw. Classe K. Akad. Wien **38,** 555 (1860).

The type of this species, of which there are fragments in the Kew Herbarium, was collected by Wawra on a sandy plain near Benguela in Angola. Since then several specimens, closely agreeing with Wawra's type, have been gathered in Benguela and Mossâmedes, but have usually been identified as *A. etbaica* Schweinf., a species not published until 1867–8. In fact *A. reficiens* is the earliest name in the complex of species including *A. etbaica* and *A. misera* Vatke, and it has been therefore necessary to decide whether *A. reficiens* is distinct or not, and if not, how the limits of the species should be defined.

A. reficiens has unfortunately been misinterpreted in the past. Oliver in Fl. Trop. Afr. **2,** 348 (1871) identified *Welwitsch* 1818, from Angola, Mossâmedes, Serra de Montes Negras, with *A. reficiens*, although he admitted that he had not seen the type of the latter and that the identification was made only from Wawra's description of *A. reficiens*. This naming was followed by Hiern in Cat. Afr. Pl. Welwitsch **1,** 313 (1896). Comparison of *Welwitsch* 1818 and the fragments of Wawra's type mentioned above shows that they can scarcely be conspecific ; *Welwitsch* 1818 having much larger and thicker leaflets of a different shape, and more falcate pods. Nothing that I have so far seen exactly fits the Welwitsch specimen, but its affinity may well be, as implied by E. G. Baker, Leg. Trop. Afr. 841 (1930), with *A. robusta* Burch.

A. misera is distinguished from *A. etbaica* particularly by its habit, being an obconical shrub branching from the base and not a tree with a well-defined trunk. The Angolan material of *A. reficiens* is uniform, and the evidence clearly indicates that its habit is that of *A. misera* ; thus *Welwitsch* 1819 bears the note " Arbor 10–20-pedalis a basi ramossissima ", and *Humbert* 16327 has a small sketch showing the habit. The field-notes of other specimens, although not so precise, give no evidence that the plants described were significantly different in appearance.

The indumentum of *A. misera* is similar to that of *A. etbaica* subspp. *etbaica*, *uncinata* and *australis*, but not to that of subsp. *platycarpa*. That of *A. reficiens* is similar to that of *A. misera*.

The number of pinnae per leaf is significant. In *A. misera* there are 1–3 pairs, and although in *A. etbaica* there are 1 9 pairs and the range thus completely overlaps, in *A. etbaica* subsp. *etbaica* some at least of the leaves

have 4 or more pairs, and in subsp. *uncinata* 5–6 pairs ; the material of subsp. *australis* is insufficient for any certainty, but it suggests that the largest leaves have at least 4 pairs. Only in *A. etbaica* subsp. *platycarpa*, whose indumentum is different from that of the other subspecies and that of *A. misera*, is the maximum number of pinnae in a few specimens less than four. In *A. reficiens* the number of pinnae in all specimens except one is 1 3 per leaf. *Welwitsch* 1819 has, however, a few leaves with 4–5 pairs.

A. reficiens differs from *A. misera* in two ways. Firstly, the pods of *A. misera* are 6–9·5 mm. wide, while in *A. reficiens* they are 8–14 mm. wide. The range partially overlaps, but the pods of *A. reficiens* may be wider than they ever are in *A. misera*. Secondly the peduncles of *A. misera* are 0·4–1 (–1·3) cm. long, while in *A. reficiens* they are 1–2 cm. long. In view of this overlapping, neither of the differences appears of major taxonomic importance, and it is proposed here to separate *A. misera* from *A. reficiens* only subspecifically.

A. reficiens, *A. misera*, and *A. etbaica* with its various subspecies are so closely related to one another that further investigation, particularly in the field, may show them all to be variants of a single species, for which the name *A. reficiens* would have to be used. For the present, in view of the very marked difference in habit that separates *A. reficiens* and *A. misera* on the one hand from *A. etbaica* on the other, I prefer to maintain the latter as a valid species.

Acacia reficiens *Wawra*.

subsp. **reficiens**

Pedunculi 1–2 cm. longi. Legumina 8–14 mm. lata.

Hab. Angola.

subsp. **misera** (*Vatke*) *Brenan*, subsp. et comb. nov.

Acacia misera Vatke in Oesterr. Bot. Zeitschr. **30,** 275 (1880).

Pedunculi 0·4–1 (–1·3) cm. longi. Legumina 6–9·6 mm. lata.

Hab. Sudan Republic, Somaliland, Uganda, Kenya.

It may well be that *Acacia uncinata* Engl. in Engl., Bot. Jahrb. **10,** 21, t. 3A (1888) is synonymous with *A. reficiens* subsp. *reficiens*. I have not seen the holotype (South West Africa, Usakos, *Marloth* 1215) and other material so named is heterogeneous, and not conclusively the same as *A. reficiens*. More good material, with field-notes, is wanted from South West Africa.

Acacia etbaica *Schweinf.* in Linnaea **35,** 330 (1867–8).

A. etbaica was described as a new species by Schweinfurth, who cited specimens from the Sudan which he himself had collected, and also others from Ethiopia. Since that time other specimens, similar and clearly related to *A. etbaica* but differing in various minor ways, from territories as far south as Kenya and Tanganyika, have gradually accumulated in herbaria. They agree with *A. etbaica* in having probably always the habit of a tree and the characteristic straight thin longitudinally veined

pods, and usually they have been referred to " species near *A. etbaica* ", or with varying degrees of doubt to *A. etbaica* itself. In an endeavour to find a more satisfactory classification of this difficult group, a study was made of this material at Kew, which showed that *A. etbaica* and its close relatives comprise a number of races, usually occupying distinct geographical regions, and separable one from another by the length of their indumentum, the width of their pods, and by the length and composition of their armature. It seems more appropriate, at least for the present, to treat these races as subspecies of *A. etbaica*, with one exception which is here described as a separate new species, *A. elatior*.

Acacia etbaica *Schweinf.*

subsp. **etbaica**

A. etbaica Schweinf. in Linnaea **35,** 330 (1867–8), sensu stricto excl. specim. abyssin.

Spinae rectae plerumque longiusculae, 6–20 (–28) mm. longae cum paucis brevioribus ; ramuli nonnunquam subinermes vel spinis tantum brevibus. Indumentum ramulorum foliorum pedunculorum minute griseo-puberulum. Rhachides foliorum et pinnarum usque ad 4-parium subtus sparse puberuli vel glabrescentes. Legumina 7–11 mm. lata.

Sudan Republic. Soturba Mountains, 7 Aug. 1865, *Schweinfurth* 1993 (BM). Soturba Mountains, Gebel Shellal, 23 Apr. 1864 (frt.), *Schweinfurth* 1994. Soturba Mountains, Wady Soturba, 6 July 1864 (fl.) *Schweinfurth* 1995 (K, BM) :—small tree. Wadi Osir–Eira, near Gebel Elba, 20 Feb. 1933 (frt.), *B. K. Cooke* 119 :—tree up to 7·5 m. high ; trunk almost black ; branches mostly crowded at top, making a half-sphere, round side uppermost. Gebel Elba, 12 Jan. 1928 (frt.), *Newberry* 106 (BM). Gebel Ekwal, Gebel Elba, 26 Jan. 1933, *Shabetai* F.1520 (175). Erkowit, 3 Mar. 1932 (frt.), *Aylmer* 233 :—large shrub. Erkowit (Gebel Irba), *Andrews* 2715 :—small tree ; bark rough. Erkanib, between Suakin and Berber, 1868, *Schweinfurth* 232 (K, BM). Mugatil, 11 Mar. 1936 (frt.), *B. K. Cooke* 199 :—" growing mostly as thick bush. Karora Hills, Katai Geraita, Feb. 1923 (fl.) *Crowfoot* s.n.

Eritrea. Near Asmara, 11–12 Jan. 1937, *Pichi-Sermolli* 601 :—small tree.

Schweinfurth when he described *A. etbaica* did not give the actual numbers of his own gatherings of the species, but said that it occurred " Ad oras Nubiae in montibus Elba et Soturba dictis sub 22° lat sept." It seems reasonable to take the Kew specimens of *Schweinfurth* 1994 and 1995 from Soturba at any rate as isosyntypes of the species. For the Ethiopian specimens mentioned by Schweinfurth see under the next subspecies.

The vernacular names in the Sudan of subsp. *etbaica* are variously spelt as *arad*, *arrad*, *arrat*, *qarad*, *garrad*, *waarad*, all presumably different versions of much the same sound.

subsp. **uncinata** *Brenan*, subsp. nov.

A. etbaica Schweinf. in Linnaea **35,** 330 (1867–8), pro parte, quoad spec. abyssin.

A. petersiana Vatke var. ? : Vatke in Oesterr. Bot. Zeitschr. **30,** 276 (1880).

Spinae saepius ± curvatae vel uncinatae, [nonnunquam fere rectae], plerumque breves et usque ad 7 mm. longae, [raro (*Hemming* 10) spinis rectis longis usque ad 2·7 cm. vel (*Dawkins* D. 286, *Eggeling* 2423) ad

5·5 cm. longis cum aliis brevibus immixtis ; ramuli nonnunquam subinermes]. Indumentum ramulorum etc. ut in subsp. *etbaica*. Rhachides foliorum et pinnarum usque ad 5–6 (–9) parium plerumque undique dense puberuli. Legumina [(6–) 7]–8–11 [(–12)] mm. lata.

Arabia. Hills to the N. of El Gebel near Qa'taba, 7 Jan. 1890 (frt.), *Deflers* 253.

Eritrea. Aitala near Acrour, 1950 m., 5 Apr. 1892, *Schweinfurth & Riva* 1303. Near Acrour, 1900 m., 18 Apr. 1892 (fl.) *Schweinfurth & Riva* 1689. Adi Ugne, 19 Apr. 1894 (fl.), *Schweinfurth* 248.

Ethiopia. Road from Mai Goigoi to Dobresina, *Quartin Dillon & Petit* 121. *Schimper* 563 (K, BM) 1057. Gobelli, 1740 m., 2 Mar. 1933 (fl.), *Gillett* 5269:—tree 4 m. ; flowers white. Near Aubarre, 1370–1520 m., Nov. 1941 (fl.), *Hummel* 29 (EA) :—small tree in very stony ground. Valley E. of Amaro Mtns., 1370 m., 23 Dec. 1952 (frt.), *Gillett* 14769 (K, EA) :—alluvial flood-plains ; tree with spreading crown much like that of *A. spirocarpa*.

British Somaliland. Without precise locality, *Drake Brockman* s.n. ; *Peck* 263 (K, EA) ; 284 (K, EA) ; 5 Jan. 1945 (frt.), *Glover & Gilliland* 492 (K, BM, EA) :—common small tree 2·4—4 m. high with a flat top and gnarled trunk branching sparingly from the base, occasionally an untidy tree of 6 m. with an irregular bole. Ahl Mtns., 2000 m., Mar. 1873 (fl.), *Hildebrandt* 838 (BM). Sugli, Al Hills, 1440 m., 23 Nov. 1929, *Collenette* 336 :—shrub 4·5 m., on stony ground, chiefly on valley floor, frequent. Duwi, 1070–1220 m., 21 Oct. 1932 (fl., frt.), *Gillett* 4398 :—tree 3 m. with a well-defined bole in grass patches between *Buxus* scrub. Erigavo, Nov. 1938 (fl., frt.), *McKinnon* 8/220 (K, holotypus subspeciei) :—low, twisted and gnarled tree. Near Sheik, 1 Sept. 1952 (fl., frt.), *Hemming* 28 (K, EA). Burao–Berbera road, 18 Aug. 1952 (fl.), *Hemming* 10 (K, EA). Hargeisa, 1310 m., 21 Sept. 1932, *Gillett* 3934. Aiba aanoleh, S.E. Hargeisa, 1400 m., 10 Oct. 1952, *Keogh* 98 :—grows to big tree 60–120 cm. girth and 6 m. high.

Uganda. Acholi District : Orom, 1070 m., 11 Oct. 1947 (fl., frt.), *Dawkins* D. 286 (EA) :—12 m. high tree, tending to be flat-topped ; bark grey-brown, very coarsely longitudinally fissured and flaking, hard ; slash white below bark ; flowers white. Karamoja District : Moroto, Feb. 1936 (fl.), *Eggeling* 2976, 5 Mar. 1936 (frt.), *Michelmore* 1255 :—slender flat-topped tree with grey stringy bark. Chua, Rom Rest Camp, Dec. 1935 (frt.), *Eggeling* 2360, 2422, 2423 (all BM). Pirre, 1524 m., 10 Nov. 1939 (frt.), *A. S. Thomas* 3257, 3258 :—trees 9–12 m. high ; flowers white.

Kenya. Mombasa, Mariakani, 7 Oct. 1949, *Hornby* 3108 (EA) :—forming dense thickets on overgrazed lands.

A. etbaica subsp. *uncinata* is very closely related to subsp. *etbaica*, differing primarily in the rhachides of the leaves and pinnae being ± densely puberulous on their lower side instead of being glabrescent, and secondarily in the tendency to produce short hooked spines. *Gillett* 3934 and *Glover & Gilliland* 492, and the Eggeling specimens from Rom, Uganda, although cited above under subsp. *uncinata*, are really transitional between the two subspecies, having glabrescent leaf-rhachides as in subsp. *etbaica* but the short ± curved spines of subsp. *uncinata*. A further distinguishing character of subsp. *uncinata* is that while the pinnae of the well-developed leaves of most specimens of subsp. *etbaica* are up to 4 pairs (more not seen), the pinnae of some leaves at least in every specimen of subsp. *uncinata* range up to 5–6 or even sometimes to 9 pairs.

Subsp. *uncinata* is a common plant of Somaliland, well-known as *sugsug* or *sogsog*, or else as *yube* or *youbi*.

Sheet two of the holotype at Kew shows remarkable brown galls, clustered and composed of numerous overlapping scales, each gall slightly reminiscent of a lily bulb in miniature.

subsp. **australis** *Brenan*, subsp. nov.

Spinae ± curvatae, breves, usque ad 4 mm. longae. Indumentum ut in subsp. *etbaica*. Rhachides foliorum et pinnarum puberuli vel glabrescentes. Legumina 11–15 mm. lata.

Tanganyika. Pare District : Kisiwani, 610 m., 26 June 1942 (frt.), *Greenway* 6498 (K, EA) :—much branched flattish-crowned tree up to 9 m. high with rough grey bark ; very local with *Acacia bussei*, *A. nilotica* subsp. *subalata*, *A. stuhlmannii*, *Entada rotundifolia*, *Dobera loranthifolia* and *Balanites* in a black cotton soil plain subject to seasonal flooding and covered with *Sporobolus glaucifolius*, *Abutilon indicum* herbage : vernacular name (Kipare) " mshaganu " ; bark chewed as a stimulant. Tanga District : Ngomeni, 120 m., 25 Aug. 1944 (frt.), *Greenway* 7034 (K, holotypus subspeciei, EA, isotypus) :—much branched tree to 7·5 m. with erect slightly spreading branches, grey-brown lightly fissured bark and globular heads of white sweetly scented flowers ; local in *Acacia nigrescens*, *Commiphora africana*, *Lannea stuhlmannii*, *Ormocarpum* scattered trees grassland.

A. etbaica subsp. *australis* has the close puberulous indumentum of subsp. *etbaica* and subsp. *uncinata*, but is distinguished from both by the wider pods. It is in addition separated geographically. By its combination of characters it to some extent connects the two preceding subspecies with the following one.

subsp. **platycarpa** *Brenan*, subsp. nov.

Spinae saepius dimorphae, aliae breves plus minusve uncinatae vel curvatae usque ad circiter 6 mm. longae, aliae elongatae rectae usque ad circiter 6 cm. longae. Indumentum foliorum pubescens, pilis brevibus sed distinctis plus minusve patentibus. Legumina (10–) 11–15 (–19) [(—22)] mm. lata.

Kenya. Northern Frontier District : Ol Doinyo Nyiu, 2 July 1944 (frt.), *Davidson* 30 *in Bally* 4437 :—tree to 6 m. Moyale, 790–970 m., base of escarpment, 26 July 1952 (fl., frt.), *Gillett* 13641 (K, holotypus subspeciei, EA, isotypus) :—in montane scrub ; tree 8–10 m. ; ultimate branches ascending ; flowers cream : vernacular name (Boran) " al kabes " or " ala kabesa ". Mount Kulal, W. slope, 1370 m., 15 Oct. 1947 (frt.), *Bally* 5647 :—small shrub in scrub in consociation with whistling thorn. Mem District : Isiolo, 1220 m., Mar. 1950 (frt.), *Dale* K 790 :—tree to 12 m., similar to and mixed with *A. tortilis*. Isiolo, 1100 m., 20 Feb. 1953 (fl., frt.), *Gillett* 15156 (K, EA) :—with *A. tortilis* on lava ; tree 8–10 m. ; branches pointing upwards ; flowers white or nearly so. 8 km. S. of Isiolo. 20 Nov. 1952, *Hemming* 92 (EA) :—thorny bush to 2·4 m., in mixed grassy woodland with lava boulders and *Acacia tortilis* dominant. Kitui District ? : Yatta Plain, at base of escarpment toward Mwita Siana stream, 1220 m., 21 Jan. 1938 (frt.), *D. C. Edwards* 101 (frt.) :—sandy red loam ; tree 3–6 m. high, one of the dominant types in dry thorn-bush of this area. Masai District : Ngong Hills to Magadi, 1310 m., 9 Dec. 1947 (frt.), *Bogdan* 1431 :—slopes with scattered acacias. 19 km. N. of Namanga, on main road, 1280 m., 30 Jan. 1952 (frt.), *Trapnell* 2205 :—small tree with spreading somewhat ascending branches, in acacia-desert grass country. Near Taveta, 820 m., 1 Feb. 1952 (frt.), *Trapnell* 2214 :—in half open *Acacia–Commiphora* dry thicket country ; compact chestnut-red loam ; bush ; thorns hooked, with occasional long straight ones ; pods veined, glaucous. Kwale District : between Samburu and Mackinnon Road, 350 m., 2 Sept. 1953 (fl.), *Drummond and Hemsley* 4114 :—in *Acacia–Commiphora* thorn-bush ; tree with spreading crown, 8 m. high ; bark grey, longitudinally fissured ; flowers creamy-yellow, very sweet-scented and attracting butterflies.

Tanganyika. Masai District : Naberera, Oct. 1934 (frt.), *Hornby* 7 (K, EA) :—tree to 9 m., with rounded crown, common on limestone ridge. Kitumbeine, 1520 m., 6 Jan. 1936 (frt.), *Greenway* 4265 (K, EA) :—growing in a *Commiphora–Acacia–Boscia* association in a very stony brown volcanic soil, locally common ; a much branched tree up to 9 m. high with purplish pods ; bark used for gonorrhoea : vernacular name (Kimasai) " osimanulie ". Pare District : N. Pare Mtns., 1955, *Ivens* 569 (EA). Lushoto District : Mkomazi, 610–910 m., 30 Nov. 1935 (frt.), *B. D. Burtt* 5326 :—in desert *Commiphora* country at foot of Pare Mountains, also on dry slopes ; common in the area ; flat-crowned tree in maturity 3–4·5 m. high, with very dark pods in profusion. Mashewa, 460 m., 6 Mar. 1952 (fl., frt.), Mrs. *Faulkner* 924 :—small tree.

A. etbaica subsp. *platycarpa* is the most distinct of the four subspecies. From the other three it differs primarily in the wider pods, which however often show considerable variation in width in a single gathering ; thus *Gillett* 13641, the holotype of the subspecies, has pods ranging from 10–19 mm. wide. *Burtt* 5326 from Mkomazi in Tanganyika is alone in having the characters of subsp. *platycarpa*, notably the indumentum, but

with the pods, which are seemingly quite mature, only 10–11 mm. wide. It is possible that further collecting at Mkomazi may show that the pods of subsp. *platycarpa* have a greater range of width in this locality, but the Kew sheet of *Burtt* 5326 has at least 10 pods either in their entirety or as valves, and appears to be representative, and there is further material of this number, equally uniform, at the British Museum (Natural History). The occurrence of narrow pods in this gathering, and of pods in subsp. *australis* as wide as those of subsp. *platycarpa*, must at present be taken as evidence for making *platycarpa* a subspecies and not a separate species.

The subsp. *platycarpa* also differs from the others in the pubescent not puberulous indumentum, which is particularly noticeable on the rhachides of the leaves, enabling it to be separated from the other subspecies even when pods are lacking. In this state there is also a decided similarity to *A. tortilis* subsp. *spirocarpa*, which with it is sometimes noted as growing. The latter has the young branchlets more or less densely pubescent, while in subsp. *platycarpa* they are glabrous or nearly so.

This is an appropriate place to consider the identity of *Acacia holstii* Taub. in Pflanzenw. Ost-Afr. **C,** 194, t. 21 C (1895), which has long been a problem. It was based on *Holst* 8744, Tanganyika, Lushoto District, Mashewa, of which there is an isotype at Kew agreeing, as far as it goes, with the original description, and unquestionably referable to *A. hockii* De Wild. (*A. stenocarpa* auct. non Hochst. ex A. Rich.). If *A. hockii* and *A. holstii* were really conspecific, then the latter would be earlier and the correct name for the species. However there is a serious obstacle to this : Taubert described the pods of *A. holstii* and also illustrated them, and though there are none with the Kew isotype of *A. holstii*, they are very different indeed from those of *A. hockii*. In 1952, in response to a request, Mrs. Faulkner very kindly visited Mashewa, the type-locality of *A. holstii*, to look for acacias, and though she found only one in flower (No. 924) this proved, surprisingly, to be *A. etbaica* subsp. *platycarpa*, at that time without a name and not previously known from the Usambaras. Now the pods described and illustrated for *A. holstii* are a very close match indeed for those of *A. etbaica* subsp. *platycarpa*, but not for those of any other East African species except *A. elatior*, which is not known from Tanganyika ; in fact some collected by Mrs. Faulkner at Mashewa are very similar to the one illustrated under *A. hockii*. It is also significant that Taubert remarked that *A. holstii* was " closely related to *A. etbaica* ". The conclusion seems irresistible that *A. holstii* is a mixture of the pods of *A. etbaica* subsp. *platycarpa* with the twigs, leaves and flowers of *A. hockii*, and the name *A. holstii* should therefore be rejected.

Acacia elatior *Brenan*, sp. nov. ; *A. etbaicae* Schweinf. affinis, sed arbor procera riparia, alias acacias africae orientalis proceritate excedere dicta, spinis nonnunquam cavis et inflatis differt ; praeterea ab *A. etbaica* subsp. *etbaica* et subsp. *uncinata* indumento foliorum aut absente aut pilis patentibus dense pubescenti nec puberulo, spinis longioribus, leguminibus latioribus et longioribus differt, ab hac etiam spinis rectis distincta ; a subsp. *platycarpa* et subsp. *australi* spinis et longis et brevibus rectis, pinnis numerosioribus, ab hac insuper spinis saepe multo longioribus et indumento differt. Inter *A. elatiorem* et *A. abyssinicam* Hochst. ex Benth. atque imprimis species huic cognatas differentiae anglice infra datae.

Arbor riparia, procera, usque ad 18 [–25] m. alta. *Ramuli* juveniles griseo-brunnei, glabri [vel primo tantum puberuli vel diutius pubescentes], epidermide haud desquamante. *Spinae* stipulares variabiles, rectae [vel subrectae], aliae breves, subulatae, usque ad circiter 7 mm. longae, aliae elongatae, crassiores et nonnunquam inflatae, albidae, usque ad 9 cm. longae. *Folia* : petiolus [2–] 5–15 mm. longus, more ramulorum vestitus, eglandulosus [vel glandula parva 0·5 mm. diametro apice praeditus], supra sulcatus ; rhachis 1–6 cm. longus, glaber [vel plus minusve pubescens], inter paria pinnarum 1–3 [–4] suprema glandulis parvis ellipticis 0·3–0·7 mm. longis ornatus ; pinnae [5–] 6–9 [–13]-jugae, plerumque [1–] 2–3 cm. longae ; foliola [7–] 13–25-juga, [1·25–] 2·5–4 mm. longa, [0·5–] 0·75–1·25 mm. lata, apice obtusa, glabra [vel plus minusve ciliata], costa subcentrali utrinque prominula, nervis aliis haud cernendis. *Flores* capitati, [ochroleuci, a *Martin* 125 et *Popov* 11078 descripti] ; pedunculi axillares, fasciculati, glabri [vel pubescentes], 2–3 [–5] cm. longi, involucellis ad circiter $\frac{1}{3}$ longitudinis pedunculi supra basim positi. [*Bracteolae* anguste oblongae, obtusae, circiter 0·7–1·5 mm. longae, 0·2–0·5 mm. latae, superne ciliatae. *Calyx* circiter 2–2·5 mm. longus, praesertim in lobis pubescens, breviter 5–6-lobatus. *Corolla* circiter 2·5–3 mm. longa, in lobis 5–6 circiter 1 mm. longis extra glabra vel ± pilosula. *Staminum filamenta* circiter 4–5 mm. longa. *Antherae* 0·2 mm. latae, saltem aliquae alabastro glandula caduca ornatae. *Ovarium* breviter stipitatum, glabrum, 1 mm. longum, circiter 0·3 mm. latum. *Stylus* glaber, 2·5 mm. longus, sed probabiliter etiam longior.] *Legumina* dehiscentia, subcoriacea, recta, anguste oblonga, applanata, 3–9·5 [–12] cm. longa, [1·2–] 1·5–1·8 [–1·9] cm. lata, glabra [vel imo basi pubescentia], brunnea vel purpureo-brunnea, tenuiter et oblique venosa, apice [acuta vel] rotundata, basi in stipitem 5–6 mm. longum breviter et cuneatim angustata. [*Semina* rotundata, applanata, circiter 7 mm. diametro, olivacea].

subsp. **elatior**

Ramuli, folia, pedunculi glabri vel fere glabri. Legumina omnino glabra. Spinae nonnunquam inflatae, usque ad 1·5 cm. latae, fusiformes.

KENYA. Northern Frontier District : Uaso Nyiro, 610 m., 15 May 1945 (frt.), *Mrs. Joy Adamson* 75 *in Bally* 4376 :—very large tree growing near water : vernacular name (Boran) " burbuke ". Northern Frontier/Tana River Districts : Tana R., Garissa, 4 Feb. 1956 (frt.), *Greenway* 8857 (K, holotypus speciei) :—tree up to 18 m. tall with dense rounded crown and pendulous branchlets ; bark rough, almost black, longitudinally deeply fissured ; pods flat, oblong, pendulous ; spines small, erect, with large white oblong fistular ones scattered on the older branches, but not always so on all trees ; very common with *Acacia tortilis* subsp. *spirocarpa*, *Trichilia roka* (*T. emetica*), *Kigelia*, *Borassus* (rare), *Hyphaene*, *Phoenix*, *Garcinia*, *Mimusops*, *Cordia gharaf.*, *Populus dehnhardtiorum* on the sandy river banks : vernacular name (Kiduruma) " munga ". Kitui District : Nyali, Thua R., 1953, *L. C. Edwards* E 258 (K, EA) :—tree to 21 m. ; lowest branches 10 m. from ground ; a fringing tree of dry sandy rivers, indicating subsoil water.

subsp. **turkanae** *Brenan*, subsp. nov.

Ramuli, spinae, rhachides foliorum, pedunculi pilis patentibus plus minusve dense pubescentes. Legumina basim versus necnon in stipite pubescentia. Spinae inflatae non visae.

SUDAN REPUBLIC. 48 km. N. of Kapoeta, 11 Feb. 1939 (frt.), *Myers* 10421 :—large trees with dark longitudinally fissured bark, in grove with dominant *A. tortilis* subsp. *spirocarpa* : vernacular name (Topotha) " nyarenai ".

Uganda. Karamoja District : Moroto R., at base of escarpment, Feb. 1936 (frt.), *Eggeling* 2970 :—tree 9 m. high, at riverside, growing in sand ; spines usually small, some long and straight up to 3·8 cm. long.

Kenya. N.W. Turkana : Lokitaung, 700 m., Feb. 1943 (frt.), *Dale* K. 305 *in C.M.* 16612 (EA) :—spreading riparian tree 12 m. high. R. Gapuss E. of Muruassigar, 610 m., Apr. 1944 (fl., frt.), Dale K.376 (K, EA) :—common riparian tree associated with *Acacia tortilis*, up to 15 m., with brown black deeply and irregularly furrowed bark : vernacular name (Turkana) " ewoi ". Oropoi, 1070 m., Apr. 1944 (frt.), *Dale* K.377 (K, EA) :—tree to 12 m. Lodwar, 490 m., 31 Mar. 1954 (frt.), *Hemming* 250 (K, holotypus varietatis, EA, isotypus) :—tree to 21–25 m., growing on river-bank with *Acacia tortilis* and *Hyphaene* sp. ; bark roughly ribbed. Lorogumu, 25 Sept. 1954 (fl., frt.), *Popov E.A.H.* 11078 (EA) :—large spreading tree up to 15 m. high, common along all major rivers. Turkana Province (without more precise locality), 670 m., 4 May 1934 (fl.), *W. H. R. Martin* 125 :—spreading tree 15 m. high on bank of usually dry river ; flowers very pale yellow.

Dr. B. Verdcourt writes (on Edwards E. 258) that this " is the largest Acacia in E. Africa and the commonest tree in Ukamba. Common also in Turkana."

More information and material is required, especially of the flowers. So far Dr. Greenway's type-collection from Garissa is the only one to show or even comment on the " ant-galls " and their occurrence ; whether they occur elsewhere, especially in Turkana, is unknown. Even the value of those features used here to indicate subsp. *turkana* is provisional : *Hemming* 250 and *Martin* 125 are very strongly pubescent, but the Dale specimens are less so.

Eggeling 2970 was cited by Eggeling and Dale, Indig. Trees Uganda, ed. 2, 209 (1952) under *A. etbaica* Schweinf.

A. elatior, besides having affinity with *A. etbaica*, is also closely akin to *A. abyssinica* Hochst. ex Benth. subsp. *abyssinica* and to three related species recently described by Professor Pichi-Sermolli, *A. bavazzanoi*, *A. negrii* and *A. pilispina*. From typical *A. abyssinica* it differs in having fewer pinnae per leaf, usually up to 9 pairs, but occasionally to 13, and in being a lowland species not occurring above about 1070 m., while *A. abyssinica* has 15 or more pairs of pinnae on well-developed leaves, and is a montane species occurring between about 1850 and 2800 m. altitude. The other three species are all described as small trees or shrubs up to 6 m. high ; there is some indication that *A. pilispina* may attain the stature of a fair-sized tree, but this is very easily separable from *A. elatior* by its indumentum of long dense spreading hairs (recalling that of *A. rehmanniana* Schinz), and by the epidermis of the older branchlets falling away to expose a yellowish under-bark. *A. bavazzanoi*, which is perhaps the nearest to *A. elatior*, differs in its small size and the epidermis falling away as in *A. pilispina*, exposing a yellowish layer. *A. negrii* differs from *A. elatior* in the broader pods, longer pinnae, low habit, and occurring at high elevations (2800–3050 m.).

A LIST OF OXFORDSHIRE FUNGI.

(C. G. Hughes and H. H. Phillips)

Mycological literature abounds in lists of fungi said to have been collected in particular localities or counties. Most of these lists, like those published annually by the British mycological society, are scientifically worthless in that they are not substantiated by preserved and verifiable specimens or by adequate descriptions of the collections concerned. It has, therefore, seemed worth while to place on record a list of some 300 species of the larger fungi gathered by the late Mr. C. G. Hughes and Dr. H. H. Phillips around Bicester and Stonesfield, Oxfordshire, and adequately described by them both as to macroscopic and microscopic characters. Mr. Hughes' early records, from the first decade of this century, are substantiated only by rather crude water-colours and hence can only be accepted for easily recognised species. He appears thereafter to have lost interest in the subject until Dr. Phillips retired to Bicester in 1940. From then until Mr. Hughes' death in July 1952 they cooperated actively in collecting, studying and recording the local basidiomycetes and the larger ascomycetes. Their records have now been deposited at Kew and from them the following list of verifiable determinations has been extracted.

It is somewhat remarkable that the collections from Oxfordshire localities do not include a single species of *Cortinarius*, though Phillips had notes on *C. cinnabarinus* Fr. from Buckinghamshire and Hughes left drawings of several Cortinarii from localities in other parts of England. The district in which they worked lies between the areas of native beech-woods in the Chilterns and the Cotswolds and does not include any old-established forests. Presumably it is on that account very poor in such mycorrhizal genera as *Cortinarius*, *Russula* and *Lactarius* ; most of the few records in the latter genera have in any case been rejected as insufficiently substantiated by modern standards. Even when these uncertain records are counted, however, there are still only a dozen collections of Russulaceae. The list which follows may probably be regarded as fairly characteristic of the larger fungus flora in those parts of the English lowlands where extensive oak and beech woods are absent and the most abundant trees are elms and willows, supplemented by small belts of planted beech and relatively modern plantations of conifers.

R.W.G.D.

Agaricales

Hygrophoraceae

Hygrophorus cossus (Sow. ex Berk.) Fr. Rousham Oct. 1903.

Hygrophorus leucophaeus (Fr.) Karst. Park land, Stonesfield 8.8.1944 ; deciduous woods, Stonesfield, 25.11.1943.

Hygrophorus chrysaspis Metrod under beech, Stonesfield, 25.10.1943.

Camarophyllus nemoreus (Pers. ex Fr.) Kummer beech wood, Stonesfield, 30.10.1942.

Camarophyllus pratensis (Pers. ex Fr.) Kummer grass fields, Bicester 5.10.1950.

Camarophyllus virgineus (Wulf. ex Fr.) Kummer grass fields, Bicester 25.10.1944.

Hygrocybe calyptraeformis (Berk. & Br.) Fayod Rousham.

Hygrocybe chlorophana (Fr.) Wünsche Bicester 28.8.1950.

Hygrocybe coccinea (Schaeff. ex Fr.) Kummer Bicester 12.9.1951.

Hygrocybe conica (Scop. ex Fr.) Kummer fields, Launton, 17.8.1941.

Hygrocybe nigrescens (Quél.) Lange meadows, Bicester, 29.8.1941 ; 23.9.1951.

Hygrocybe obrussea (Fr.) Wünsche meadows, Bicester 17.9.1941.

Hygrocybe psittacina (Schaeff. ex Fr.) Kummer Bicester 10.9.1950.

Hygrocybe reai (R. Maire) Lange var. *insipida* Lange grass field, Bicester, 21.8.1951.

TRICHOLOMATACEAE

Lyophyllum decastes (Fr.) Singer (= *Tricholoma aggregatum* (Schaeff. ex Secr.) Cost. & Duf.) roadside grass and around stumps, Bicester, 11.9.1950 ; 23.11.1951.

Calocybe carnea (Bull. ex Fr.) Kühner in short grass under oak, Bicester, 5.7.1948.

Calocybe gambosum (Fr.) Singer in meadows, Stonesfield 24.4.1943 ; in rings 16 and 25 feet across, Bucknell 1.5.1945.

Laccaria laccata (Scop. ex Fr.) Cooke Bicester.

Clitocybe clavipes (Pers. ex Fr.) Kummer conifer plantation Bignell 8.10.1943.

Clitocybe flaccida (Sow. ex Fr.) Kummer conifer plantation, Bucknell, 12.9.1942 ; Rousham, 19.10.1902.

Clitocybe fragrans (Sow. ex Fr.) Kummer in grass between pine woods, Stonesfield, 21.10.1943 ; Bicester 30.10.1948.

Clitocybe geotropa (Bull. ex Mérat) Quél. under elms, Bicester 18.11.1948.

Clitocybe geotropa var. *maxima* (Fr.) Nuesch under beeches, Middleton bridle path, Dec. 1940.

Clitocybe infundibuliformis (Schaeff. ex Weinm.) Quél. Bicester 13.11.1934.

Clitocybe inornata (Sow. ex Fr.) Gillet in beech litter near Ashford Mill, Stonesfield, 28.11.1943.

Clitocybe nebularis (Batsch ex Fr.) Kummer Shelswell Park, Bicester 27.9.1935.

Lepista luscina (Fr.) Singer (= *Tricholoma panaeolum* (Fr.) Quél.) in meadows, Wendlebury, 24.10.1941 ; Bicester 3.10.1944.

Lepista nuda (Bull. ex Fr.) Cooke grass between pine woods, Stonesfield, 21.10.1943.

Lepista personata (Fr.) Cooke meadows, Launton, 12.10.1942 ; Bicester, 2.12.1949 ; 2.10.1950.

Lepista sordida (Fr.) Singer Stonesfield, 17.9.1942.

Tricholomopsis rutilans (Schaeff. ex Fr.) Singer under *Larix*, Grove Hill wood, 29.11.1940 ; on stump of *Picea*, Bucknell, 12.9.1942.

Collybia bresadolae Kühner & Romagnesi (= *C. acervata* auct.) under beech, Stonesfield, 21.10.1943 ; Bignell plantation, 26.10.1949.

Collybia fusipes (Bull. ex Fr.) Quél. on oak roots, New Barn Farm, Stonesfield, 3.11.1942.

Collybia lupuletorum (Weinm.) Gillet sensu Bres. on elm log, Bicester 4.4.1948.

Collybia peronata (Bolt. ex Fr.) Kummer Barton 9.6.1905 ; under beech, Stonesfield, 30.7.1944.

Omphalina pyxidata (Bull. ex Fr.) Quél. in moss, Rousham, 1906.

Armillaria mellea (Vahl ex Fr.) Kummer Barton, 15.9.1904 ; Bicester, 5.10.1948 ; Shelswell, 9.11.1940.

Tricholoma (*Dermoloma*) *atrocinereum* (Pers.) Quél. on lawn, Barton, 16.9.1904.

Tricholoma scalpturatum (Fr.) Quél. under larch and other conifers, Bucknell, 12.9. 1942 ; Stonesfield, 16.10.1943 ; 1.11.1943.

Tricholoma terreum (Schaeff. ex Fr.) Kummer under conifers, Bucknell, 24.11.1934.

Cantharellula cyathiformis (Bull. ex Fr.) Singer amongst grass, Ditchley woods, 4.12.1942 ; Bicester, Dec. 1949.

Lentinellus cochleatus (Pers. ex Fr.) Karst. Nuneham Park, 15.9.1949.

Melanoleuca grammopodia (Bull. ex Fr.) Pat. on neglected lawn, Launton, 25.11.1948.

Melanoleuca melaleuca (Pers. ex Fr.) Murr. meadows, Wendlebury, 21.10.1941 ; Stonesfield, 1.12.1943 ; Chesterton, 29.9.1948.

Resupinatus applicatus (Batsch ex Fr.) S. F. Gray on rotten wood, Bicester, 13.12.1947.

Hohenbuehelia atrocaerulea (Fr.) Singer on stump, Bignell, 19.10.1948.

Schizophyllum commune Fr. on an orange box, Bicester, 8.3.1948.

Pleurotus cornucopiae (Paulet ex Pers.) Gillet on dead elms, Bicester, 18.8.1941 ; 29.8. 1949 ; Chesterton, 23.5.1945.

Pleurotus dryinus (Pers. ex Fr.) Kummer on pollard willow, Little Chesterton, 18.11. 1941 ; on stump, Ardley, 3.5.1951.

Pleurotus lignatilis (Pers. ex Fr.) Kummer on elm logs, Bicester, 25.10–2.12.1948.

Pleurotus ostreatus (Jacq. ex Fr.) Kummer var. *salignus* (Pers. ex Fr. Konr. & Maubl. on pollard willow, Bicester, 19.11.1948.

Pleurotus ulmarius (Bull. ex Fr.) Kummer on dead elm, Bicester, 19.10.1947.

Oudemansiella mucida (Schrad. ex Fr.) Höhn. on beech, Shelswell Park, 27.10.1935.

Oudemansiella radicata (Relh. ex Fr.) Singer Rousham, 30.7.1901 ; Oct. 1902 ; 16.11. 1940 ; Bicester, 24.8.1941 ; 27.11.1950 ; Stonesfield, 17.8.1944.

Hemimycena acicula (Schaeff. ex Fr.) Singer Bicester, 14.10.1950.

Hemimycena adonis (Bull. ex Fr.) Singer on Larch twig, Grove Hill Wood, 8.10.1941.

Hemimycena hiemalis (Osbeck ex Fr.) Singer on elm bark, Bicester, 9.2.1948.

Hemimycena flavoalba (Fr.) Singer amongst grass, Bicester, 24.10.1948.

Hemimycena lactea (Pers. ex Fr.) Singer on spruce needles, Bucknell, 11.2.1942.

Hemimycena olida (Bres.) Singer on mossy elm stumps, Merton, 15.11.1941 ; Bicester, 21.12.1942.

Hemimycena setipes (Fr.) Singer (= *Omphalia fibula* (Fr.) Kummer var. *swartzii* (Fr.) Karst.) Rousham, 1906.

Hemimycena speirea (Fr.) Singer on fallen branches, Bicester, 27.10–25.11.1949.

Marasmiellus ramealis (Bull. ex Fr.) Singer Bicester, 6.8.1947.

Flammulina velutipes (Curt. ex Fr.) Karst. on pollard willow, Bicester, 21.12.1942 ; on elm stump, Chesterton, 12.2.1951.

Pseudohiatula esculenta (Wulf ex Fr.) Singer subsp. *esculenta* on spruce needles and cones, Bucknell, 11.2.1942.

Marasmius graminum (Lib.) Berk. on lawn, Bicester, 19.7.1950.

Marasmius oreades (Bolt. ex Fr.) Fr. grass fields, Bicester, 24.10.1943.

Marasmius rotula (Scop. ex Fr.) Fr. on twigs, Bicester, end of August 1948.

Crinipellis stipitaria (Fr.) Pat. on grass, Stonesfield, 31.10.1943 ; Bicester, 23.8.1951.

Mycena alcalina (Fr.) Kummer in hollow willow, Bicester, 22.12.1942 ; on conifer stump, Bignell, 28.9.1950.

Mycena amicta (Fr.) Quél. on wood in larch plantation, Stonesfield, 1.11.1943.

Mycena ammoniaca (Fr. ex Secr.) Quél. among grass under trees, Bignell, 24.10.1949.

Mycena avenacea (Fr.) Quél. Belmont, C. G. Hughes, undated.

Mycena chlorantha (Fr.) Kummer in hedge bottom, Bicester, 19.11.1950.

Mycena epipterygia (Scop. ex Fr.) Kummer wood at Rousham, 12.10.1902 ; 23.11.1940.

Mycena filopes (Bull. ex Fr.) Kummer sensu Lange in copse, Bicester, Oct. 1947.

Mycena galericulata (Scop. ex Fr.) Kummer Rousham, 2.10.1902 ; 16.11.1940 ; on dead trunks, Bicester, 6.11.1948 ; Oct. 1949 ; on hazel stump, Stonesfield, 7.9.1942.

Mycena galopus (Pers. ex Fr.) Kummer Rousham, 24.10.1902.

Mycena haematopus (Pers. ex Fr.) Kummer on elm stump, Stonesfield, 10.12.1943.

Mycena parabolica (Fr.) Quél. sensu Lange twigs in hedge bottoms, Bicester, 10.11.1946.

Mycena pura (Pers. ex Fr.) Kummer under beech, Middleton Stoney, 3.12.1941 ; Bignell, 24.10.1949.

Mycena rorida (Scop. ex Fr.) Quél. larch plantation, Stonesfield, 29.10.1943.

Mycena sanguinolenta (Alb. & Schw. ex Fr.) Kummer Bignell, 23.10.1949.

Mycena tenerrima (Berk.) Sacc. on elm stump, Bicester, 24.11.1949.

Amanitaceae

Amanita echinocephala (Vitt.) Quél. under beech, Wheatfield Park, 9.10.1942.

Amanita rubescens (Fr.) S. F. Gray under beech, Rousham, 30.6.1901.

Amanita (*Amanitopsis*) *fulva* (Schaeff. ex) Secretan unlocalised, under oak.

Amanita (*Amanitopsis*) *inaurata* Secretan Rousham, 28.6.1901.

Amanita (*Amanitopsis*) *vaginata* (Bull. ex Fr.) Vitt. Ardley wood, 22.6.1952.

Rhodotus palmatus (Bull. ex Fr.) R. Maire on elm logs, Bicester, 30.8.1941 ; 3.11.1941 ; 3.9.1944.

Volvariella speciosa (Fr.) Singer farm yard, Stonesfield, 25.6.1943 ; on spoiled hay, Bicester, 16.10.1950.

Pluteus cervinus (Schaeff. ex Fr.) Kummer on elm stump, Bicester, 4.10.1945 ; on willow, 20.10.1947 ; on ash stump, Pingle, 10.9.1948.

Pluteus lutescens (Fr.) Bres. in hollow willow, Bicester, 28.12.1942 ; on stump, Bignell, 19.10.1944.

Lepiota badhami (Berk.) Quél. Rousham 10.11.1902.

Lepiota acutesquamosa (Weinm.) Kummer Rousham, 23.10.1903 ; Stonesfield, 28.9.1942.

Lepiota cristata (Fr.) Kummer Barton, 13.11.1904 ; Bicester, 6.10.1941.

Lepiota excoriata (Schaeff. ex Fr.) Kummer Bicester 6.9.1943.

Lepiota mastoidea (Fr.) Kummer meadows, Bicester, 30.9.1949.

Lepiota rachodes (Vitt.) Quél. under elm, Bignell, 19.10.1898 ; under privet hedge, Bicester, 19.6.1935 ; 1.8.1936 ; 17.9.1938 ; 12.6.1939 ; among *Urtica* in hedge, 6.10.1947.

Melanophyllum echinatum (Roth ex Fr.) Singer in a frame, Stonesfield Manor, 11.11. 1943.

Agaricus augustus Fr. under elm, Bicester, 19.9.1944.

Agaricus silvicola (Vitt.) Sacc. Bicester, 20.9.1944.

Cystoderma amianthina ([Scop.] Fr.) Fayod Rousham, 19.10.1902.

Coprinaceae

Coprinus atramentarius (Bull. ex Fr.) Fr. hedge bottom, Bicester, 5.5.1943 ; elm stump, Launton, 13.10.1948.

Coprinus boudieri Quél. hedge bottom, Bicester, 31.3.1950.

Coprinus comatus (Müll. ex Fr.) S. F. Gray C. G. Hughes, undated.

Coprinus friesii Quél. on lawn grass, Bicester, 15.6.1945 ; July 1950.

Coprinus lagopides Karst. on a ceiling, Bicester, 25.3.1951 ; 14.4.1953 ; 15.12.1953.

Coprinus lagopus (Fr.) Fr. Waines copse, Bicester, 27.9.1947.

Coprinus micaceus (Bull. ex Fr.) Fr. on logs, Bicester, 27.3.1945 ; on elm stump, 26.7.1946.

Coprinus niveus (Pers. ex Fr.) Fr. on horse dung, Bicester, 30.11.1941 ; 28.6.1946.

Coprinus plicatilis (Curt. ex Fr.) Fr. on lawns, Rousham, 1906.

Coprinus picaceus (Bull. ex Fr.) S. F. Gray under beech, Middleton Stoney, 6.11.1941.

Coprinus radians (Desm.) Fr. on elm log, Bicester, 27.7.1947.

Coprinus truncorum Fr. sensu Romagnesi on willow, Stonesfield, 25.10.1942 ; 26.9.1943.

Psathyrella atomata (Fr.) Quél. meadows, Bicester, 29.5.1945 ; 20.7.1947 ; 15.7.1948.

Psathyrella candolleana (Fr.) R. Maire on stump, Bicester, 13.8.1951.

Psathyrella cernua (Vahl. ex Fr.) Moser meadows, Bicester, 9.10.1947 ; Chesterton, 13.9.1943.

Psathyrella disseminata (Pers. ex Fr.) Quél around stump, Oxford, 9.9.1946.

Psathyrella gordoni (Berk. & Br.) Pearson & Dennis cluster near elm stump, Bicester, 3.10.1949.

Psathyrella gracilis (Fr.) Quél. grass field, Bicester, 4.10.1946.

Psathyrella gyroflexa (Fr.) Konr. & Maubl. amongst grass, Bicester, 30.5.1944.

Psathyrella hydrophila (Bull. ex Mérat) R. Maire around ash, Bicester, 20.10.1950.

Psathyrella multipedata (Peck) A. H. Smith in wood, Rousham, 16.11.1940.

Psathyrella obtusata (Fr.) A. H. Smith in field, Chesterton, 24.10.1954.

Psathyrella spadicea (Schaeff. ex Fr.) Singer around elm stump, Bicester, 11.11.1952.

Psathyrella spadiceo-grisea (Fr.) R. Maire hedge bottom, Chesterton, 21.5.1945.

Psathyrella subatrata (Batsch. ex Fr.) Gillet copse near Stonesfield, 30.9.1943 ; Bicester, 12.4.1948.

Psathyrella (*Lachymaria*) *velutina* (Pers. ex Fr.) Singer Bucknell fir copse, 12.9.1942 ; Bicester, roadside 6.9.1945 ; round elm stump, Aug. 1948 & 17.7.1950.

Panaeolina foenisecii (Pers. ex Fr.) R. Maire meadows, Bicester, 7.8.1947, lawn 2.7.1951.

Panaeolus campanulatus (Bull. ex Fr.) Quél. in grass, Bicester, 22.11.1941 ; 3.12.1941.

Panaeolus fimicola (Fr.) Quél. meadows, Bicester, 29.5.1945.

Panaeolus leucophanes (Berk. & Br.) Sacc. on site of manure heap, Bicester, 22.6.1946.

Panaeolus papilionaceus (Bull. ex Fr.) Quél. Bicester, 10.6.1948.

Panaeolus sphinctrinus (Fr.) Quél. in grass, Bucknell, 14.5.1945.

Panaeolus subbalteatus (Berk. & Br.) Sacc. on manure heap, Bicester, 18.10.1947.

Anellaria semiovata (Sow. ex Fr.) Pearson & Dennis meadows, Bicester, 30.5.1942 ; Stonesfield, July 1943.

BOLBITIACEAE

Conocybe antipoda (Lasch) Fayod in lush grass, Bicester, 8–11.10.1950.

Conocybe coprophila (Kühner) Kühner on horse dung, Bicester, 17.7.1944.

Conocybe lactea (Lange) Metrod in cow pasture, Bicester, 15.8.1950.

Conocybe rickeniana Singer (*C. spicula* (Lasch) Kühner sensu Kühner) lawn, Bicester, 29.10.1945.

Conocybe tenera (Schaeff. ex Fr.) Fayod var. *tenera* amongst grass by cemetery gate, Bicester, 26.10.1943, production of needles among spores noted with ammonia.

Pholiotina pygmaeoaffinis (Fr.) Singer meadows, Bicester, 5.10.1950.

Pholiotina togularis (Bull. ex Fr.) Fayod sensu Lange hedgerow, Bicester, 18.4.1951.

Bolbitius vitellinus (Pers. ex Fr.) Fr. on cow dung, Lower Chesterton field, Bicester, 12.7.1942 ; on straw and grass, Chesterton, 23.5.1945 ; Launton, 26.9.1950.

Agrocybe cylindracea (DC ex Fr.) R. Maire on stump, Bicester, 25.10–8.11.1948 ; on elm, Chesterton, 20.9.1945.

Agrocybe dura (Bolt. ex Fr.) Singer in short grass on stony bank, Stonesfield, Aug. 1944.

Agrocybe erebia (Fr.) Kühner in wood, Ardley, 22.6.1952.

Agrocybe praecox (Pers. ex Fr.) Fayod Bicester, 22.5.1948.

Agrocybe semiorbicularis (Bull. ex Mérat) Fayod in grass field, Bicester, 17.7.1947 ; 7.7.1950.

STROPHARIACEAE

Stropharia aeruginosa (Curt. ex Fr.) Quél. meadows, Frogleys, Bicester, 29.9.1950.

Stropharia coronilla (Bull. ex Fr.) Quél. in grass, Bicester, 7.7.1950 ; Stonesfield, 21.6. 1943.

Stropharia inuncta (Fr.) Quél. on lawn, Bicester, 25.10.1945.

Stropharia luteonitens (Fr.) Quél. Stonesfield, 21.7.1950.

Stropharia merdaria (Fr.) Quél. on dung, Launton, 17.8.1947 ; Bicester, 16.5.1945 ; 26.9.1947.

Stropharia semiglobata (Batsch ex Fr.) Quél. on dung, Bicester, 25.9.1947.

Hypholoma fasciculare (Huds. ex Fr.) Kummer on stumps, Bicester, 18.9.1946.

Hypholoma subericaeum (Fr.) Kühner wet field, Bicester, 10.9.1950.

Hypholoma sublateritium (Fr.) Quél. on elm stump, Bicester, 4.12.1941.

Psilocybe coprophila (Bull. ex Fr.) Kummer on dung, Bucknell, 6.6.1947.

Psilocybe semilanceata (Fr.) Kummer grass fields, Bicester, 30.4–9.5.1950.

Deconica atrorufa (Schaeff. ex Fr.) Karst. on lawn, Bicester, 29.5.1951.

Deconica inquilina (Fr.) Romagnesi on lawn, Bicester, 14.8.1948.

Pholiota aurivella (Batsch ex Fr.) Kummer on elm stump, Chesterton, Sept. 1941.

Pholiota destruens (Brond.) Gillet on willow stump, Bicester, 10.11.1948.

Pholiota lucifera (Lasch) Quél. on hollow willow, Stonesfield, 10.12.1943.

Pholiota squarrosa (Müll. ex Fr.) Kummer Rousham, 7.11.1902 ; on beech, Middleton Stoney, 5.11.1941 ; on willow, Bicester, 23.12.1945.

Pholiota (*Flammula*) *conissans* (Fr.) Moser on pollard willow, Bicester, 11–17.12.1948.

Pholiota (*Flammula*) *gummosa* (Lasch) Singer on buried stump in grass field, Bicester ; on a stump, 15.10.1946 ; 1.11.1947 ; 18.10.1945.

Kuehneromyces mutabilis (Schaeff. ex Fr.) Singer & Smith on lime stump, Bicester, Nov. 1941 ; on elm stump, 25.10.1944.

CORTINARIACEAE

Inocybe geophylla (Sow. ex Fr.) Kummer Bignell 1944 ; 18.9.1945.

Inocybe geophylla var. *lilacina* Gillet Bicester, 30.8.1948.

Inocybe godeyi Gillet larch plantation, Stonesfield, 28.9.1943.

Inocybe fastigiata (Schaeff. ex Fr.) Quél. under beech, Stonesfield, 14.9.1942.

Hebeloma fastibile (Pers. ex Fr.) Kummer under beech, Blenheim Park, 8.10.1946.

Hebeloma mesophaeum (Pers.) Quél. larch wood, Stonesfield, 2.10.1943.

Hebeloma sacchariolens Quél. copse, Bicester, 31.8.1948.

Gymnophilus penetrans (Fr.) Murr. on mossy wood, Bignell, 25.10.1949.

Gymnopilus spectabilis (Fr.) Singer on elm stump, Rousham, 2.10.1902 ; Launton, 2.11.1941 ; on ash, Chesterton, 22.9.1943.

Galerina marginata (Batsch ex Secr.) Kühner on pollard willow, Bicester, 23.12.1940 ; 20.12.1942 ; on stump, Bucknell copse, 16.10.1942 ; as *G. unicolor* (Vahl ex Somm.) Singer on willow, Stonesfield, Dec. 1943 ; on larch twigs, Bucknell, 14.10.1942 ; Bignell, Sept. 1944 ; Oct. 1945.

Galerina sideroides (Bull. ex Mérat) Kühner on sticks in conifer plantation, Bignell, 7.10.1943.

CREPIDOTACEAE

Tubaria conspersa (Pers. ex Fr.) Fayod Manor garden path, Stonesfield, 24.10.1943.

Tubaria furfuracea (Pers. ex Fr.) Gillet Ashford Mill copse, Stonesfield, 29.11.1943 ; on chips, Langford Lane, Bicester, 5.4.1947.

Tubaria pallidispora grass fields, Bicester, 31.8.1941 ; 22.12.1941 ; 11.11.1945.

Tubaria trigonophylla (Lasch) Fayod on twigs on hedgerow, Bicester, 14.2.1943.

Crepidotus cesatii Rabenh. on wood chips, Stonesfield, 31.10.1943.

Crepidotus fragilis Joss. on willow, Bicester, 22.11.1948.

Crepidotus luteolus (Lambotte) Sacc. on larch twig, Stonesfield, 1.12.1944.

Crepidotus mollis (Schaeff. ex Fr.) Kummer Rousham, 16.11.1940 ; Wendlebury, 19.12.1940 ; on poplar, Bicester, 22.9.1943 ; 28.12.1945.

Crepidotus phillipsii (Berk. & Br.) Sacc. on long grass, Bicester, 14.6.1945.

Crepidotus variabilis (Pers. ex Fr.) Kummer Rousham, 19.10.1902.

RHODOPHYLLACEAE

Clitopilus prunulus (Scop. ex Fr.) Kummer Bignell, 28.9.1950.

Rhodocybe truncata (Schaeff. ex Fr.) Singer conifer plantation, Bignell, 2.10.1944.

Entoloma clypeatum (L. ex Fr.) Kummer Barton, 29.3.1905.

Entoloma saundersii (Fr.) Sacc. meadows, Bucknell, 7.5.1945.

Entoloma sericeum (Bull. ex Mérat) Quél. meadows, Bicester, 25.8.1941 ; 16.9.1948.

Nolanea mammosa (L. ex Fr.) Quél. sensu Kühner & Romagnesi Rousham, 18.9.1950, under trees.

Nolanea staurospora Bres. Bignell, 19.9.1950.

Leptonia incana (Fr.) Gillet meadows, Bicester, 8.9.1945.

PAXILLACEAE

Hygrophoropsis aurantiaca (Fr.) R. Maire Grove Hill wood, 21.11.1940.

Paxillus atrotomentosus (Batsch ex Fr.) Fr. Bignell Park, 11.9.1945.

GOMPHIDIACEAE

Gomphidius maculatus (Scop. ex Fr.) Fr. Rousham, 20.7.1903.

BOLETACEAE

Suillus aeruginascens (Secr.) Snell (= *Boletus viscidus* Fr.) under larch, Stonesfield, 22.7.1944.

Suillus elegans (Schum. ex Fr.) Snell under larch, Stonesfield, 28.9.1942.

Suillus granulatus (L. ex Fr.) O. Kuntze conifer plantation, Bignell, 15.10.1949.

Xerocomus chrysenteron (Bull. ex Mérat) Quél. woods, Bicester, 16.9.1942.

Boletus erythropus (Fr. ex Fr.) Pers. roadside grass by beech and pine, Middleton Park, 6.8.1941.

Boletus satanas Lenz Blenheim 17.9.1949.

RUSSULACEAE

Russula drimeia Cooke fir copse, Bucknell.

Russula heterophylla (Fr.) Fr. woods, Bicester, 17.9.1942.

Lactarius deliciosus (L. ex Fr.) S. F. Gray fir copse, Bucknell, 12.9.1942.

Lactarius quietus Fr. Bignell, 26.9.1944.

Lactarius torminosus (Schaeff. ex Fr.) S. F. Gray in grass under oaks, Stonesfield, 3.11.1942.

Aphyllophorales

POLYPORACEAE

Xylodon versiporus (Pers.) Bond. on elm, Bicester, 15.3.1943 ; Bignell, 5.10.1944.

Laetiporus sulphureus (Bull. ex Fr.) Bond. & Singer on oak, Stonesfield, 26.9.1953 ; Bicester, 10.9.1949 ; on *Robinia*, Bicester, 5.9.1947.

Tyromyces caesius (Schrad. ex Fr.) Murr. on pollard willow, Middleton Stoney, 3.11.1941.

Tyromyces albidus (Schaeff. ex Secr.) Donk on fallen fir, Bignell, 26.9.1944 ; on spruce, Bignell, 7.9.1945.

Tyromyces lacteus (Fr.) Murr. on pollard willow, Bicester, 3.1.1942.

Bjerkandera adusta (Willd. ex Fr.) Karst. on beech, Middleton Stoney, 2.12.1941 ; Chesterton, 2.9.1943.

Bjerkandera fumosa (Pers. ex Fr.) Karst. on willow, Bicester, 18.11.1941 ; 3.12.1941 ; on elm, Bicester, 22.10.1941 ; 3.1.1942.

Fomitopsis annosa (Fr.) Karst. on spruce stump, Bucknell, 28.1.1942.

Fomitopsis ulmaria (Sow. ex Fr.) Bond. & Singer on elm, Bicester, 30.10.1941.

Inonotus dryadeus (Pers. ex Fr.) Murr. on oak, Blenheim Park, 15 Sept. 1949.

Inonotus cuticularis (Bull. ex Fr.) Karst. on beech stump, Rousham, 27.4.1941.

Inonotus hispidus (Bull. ex Fr.) Karst. on ash, Bicester, Feb. 1942 ; on elm, 28.8.1945 ; on hawthorn, Sept. 1944.

Phellinus igniarus (L. ex Fr.) Pat. on stump, Launton, March 1941.

Phellinus pomaceus (Pers.) R. Maire on plum, Bicester, 8.11.1946.

Phellinus ferruginosus (Schrad. ex Fr.) Bourd. & Galz. on pollard willows, Middleton Stoney, 3.12.1941 ; 11.3.1943.

Phellinus pini (Thore ex Fr.) Pilat on larch, Stonesfield, Dec. 1943.

Ganoderma applanatum (Pers. ex Wallr.) Pat. on logs, Bicester, 15.2.1941 ; Bletchingdon, 13.9.1941 ; on willow, Bicester, Feb. 1943.

Ganoderma lucidum (Leyss. ex Fr.) Karst. around stump, Launton, 7.4.1941.

Ganoderma lucidum subsp. *resinaceum* (Boud.) Bourd. & Galz. on oak, Launton, 31.8.1944.

Polyporus squamosus [Huds.] Fr. on ash, Bicester, 6.5.1941 ; on elm, 25.9.1941.

Polyporus varius [Pers.] Fr. Bicester, Oct. 1949.

Polyporus picipes Fr. on willows by the Evenlode, Coombe, April 1941 ; Pigeon lock, Bletchingdon, 14.9.1941.

Coriolus versicolor (L. ex Fr.) Quél. on ash, Bucknell, 16.1.1942 ; on willow, Bicester, Jan. 1942 ; 1.3.1953.

Trametes suaveolens (Fr.) Fr. on willow, Bletchingdon, 13.9.1941 ; Stonesfield, 5.4.1942 ; Bicester, 12.4.1945.

Pseudotrametes gibbosa (Pers.) Bond. & Singer on logs, Bletchingdon, 22.4.1941.

Cerrena unicolor (Bull. ex Fr.) Murr. on pollard willow, Bicester, 10.4.1941.

Abortiporus biennis (Bull. ex Fr.) Singer on hawthorn roots, Chesterton, 13.9.1943 ; on ? ash roots, 13.8.1945.

Oxyporus populinus (Fr.) Donk on elm, Bicester, 14.10.1944 ; 25.10.1944 ; 22.11.1945 ; 9.10.1946.

Daedala quercina L. ex Fr. on post, Bicester, 15.4.1941.

Daedaleopsis confragosa (Bolt. ex Fr.) Schroet. Blenheim, 21.9.1949.

Scutigeraceae

Polypilus giganteus (Pers. ex Fr.) Donk on beech stumps, Middleton, 3.9.1941 ; Bicester, 29.9.1947.

Polypilus frondosus (Dicks. ex Fr.) Karst. Bicester, 9.4.1949.

Fistulinaceae

Fistulina hepatica Fr. on oak, Bicester, Sept. 1945.

Meruliaceae

Merulius corium Fr. on sticks, Bucknell, 28.1.1942 ; Bicester, 1.1.1944.

Merulius tremellosus Fr. Bletchingdon, 25.2.1941 ; on willow, Stonesfield, 30.11.1940.

Hydnaceae

Auriscalpium vulgare Karst. on pine cone, Bignell park, 26.10.1949.

Mycoacia uda (Fr.) Donk on wood, Bicester, 6.10.1948.

Thelephoraceae

Coniophora puteana (Fr.) Karst. on willow, Bicester, 1.12.1945 ; 3.5.1946.

Coniophorella olivacea (Fr.) Karst. on bark, Bicester, 7.11.1945.

Phlebia radiata Fr. Stonesfield, on stump, 30.11.1942.

Asterostroma medium Bres. on rotten wood, Bicester, 14.1.1947 ; 20.2.1948.

Stereum gausapatum (Fr.) Fr. on ash stump, Wendlebury, 6.3.1941.

Stereum hirsutum (Fr.) Fr. Stonesfield, 9.12.1943.

Stereum purpureum (Fr.) Fr. on pollard willow, Middleton Stoney, 11.1.1943.

Clavariaceae

Clavaria abietina Pers. under conifers, Rousham, 8.10.1906.

Clavaria cinerea Fr. Bicester, 1.9.1950.

Typhula sclerotioides (Pers.) Fr. on twig, Bicester, Oct. 1941.

Cyphellaceae

Cyphella capula Fr. on nettle stems, Bicester, 1945.

Tremellales

Auriculariaceae

Auricula mesenterica (Fr.) Pers. on elm stump, Bicester, 12.2.1941.

Auricularia auricula (L. ex Hook.) Underw. on elder, Bignell park, 20.6.1946.

Platygloea effusa Schroet. on dead wood, June–July, 1948.

Tremellaceae

Tremella lutescens Pers. on beech branch, Bicester, Dec. 1941.

Exidia thuretiana (Lév.) Fr. on beech, Stonesfield, 5.2.1943.

Sebacina grisea (Pers.) Bres. on elm stump, Wendlebury, 1.3.1941.

Dacrymycetaceae

Calocera cornea (Fr.) Loudon on wood, Middleton Stoney, Nov. 1940.

Dacrymyces deliquescens (Bull. ex Mérat) Duby on pine branches, Barton, 4.10.1901.

Phallales

Mutinus caninus (Pers.) Fr. Dean plantation, 19.10.1902.

Lycoperdales

Calvatia excipuliformis (Pers.) Perdeck in grass field, Chesterton, 4.10.1901 ; Bicester, 11.6.1948.

Lycoperdon depressum Bon. Bucknell, 12.9.1942.

Pezizales

MORCHELLACEAE

Morchella esculenta Fr. Barton, 11.5.1905 ; Stonesfield manor garden, 27.4.1944 ; in a field, Bicester, 1.5.1950.

Mitrophora semilibera (DC ex Fr.) Lév. Barton, 11.4.1905 ; Bicester, 10.5.1941.

Verpa digitaliformis Pers. ex Fr. in copse, Bicester, 25.4.1950.

HELVELLACEAE

Helvella crispa Fr. Stonesfield, 24.10.1943.

Helvella lacunosa Afz. ex Fr. Barton, 28.9.1904.

PEZIZACEAE

Peziza micropus Pers. ex Fr. on elm stump, Bicester, 7.11.1938 ; Chesterton, on pollard willow, Jan. 1942.

HUMARIACEAE

Scutellinia scutellata (L. ex Fr.) Lambotte on wood, Bicester, 24.6.1944.

Cheilymenia theleboloides (A. & S. ex Fr.) Boud. on ground, Bicester, 10.10.1941.

Aleuria aurantia (Pers. ex Fr.) Fuckel Middleton, 3.9.1941.

Coprobia granulata (Bull. ex Fr.) Boud. on cow dung, Bicester, 10.10.1941.

ASCOBOLACEAE

Ascobolus furfuraceus Pers. ex Fr. on dung, Bicester, 12.10.1947 ; on manured soil, Stonesfield, 17.4.1952.

Pyronema omphalodes (Bull. ex Fr.) Fuckel on burnt soil, Stonesfield, 2.8.1944.

SARCOSCYPHACEAE

Sarcoscypha coccinea (Fr.) Lambotte in elder copse, Bucknell, 28.2.1941 ; 19.2.1943; Stonesfield, 17.2.1943.

Helotiales

HELOTIACEAE

Sclerotinia tuberosa (Fr.) Fuckel in spinney, Bicester, 12.4.1948.

Bulgaria inquinans Fr. on stump, Bicester, 9.11.1940.

Cyathicula coronata (Bull. ex Fr.) de Not. Barton, Nov. 1904.

Calycella sulfurina (Quél.) Boud. on bark, Bicester, 15.1.1947.

Helotium conscriptum (Karst.) Karst. on pollard willow, Wendlebury, Dic. 1942.

Helotium scutula (Pers. ex Fr.) Karst. on stems, Bicester, 30.9.1941.

HYALOSCYPHACEAE

Trichoscyphella willkommii (Hartig) Nannf. on larch cankers, Stonesfield, March 1942.

Dasyscyphus virgineus (Batsch ex Fr.) S. F. Gray on rotten wood, Bicester, 4.2.1949.

Dasyscyphus cerinus (Pers. ex Fr.) Fuckel on wood, Bicester, Sept. 1944.

PHACIDIACEAE

Propolis versicolor (Fr.) Fr. on wood, Bicester, Dec. 1947.

Rhytisma acerinum Fr. on sycamore, Bicester, Aug. 1941 ; 2.7.1950.

Taphrinales

Taphrina deformans (Berk.) Tul. on peach, Stonesfield manor, 16.5.1944 ; Middle Barton, June 1951.

Sphaeriales

Xylariaceae

Xylaria polymorpha (Pers. ex Fr.) Grev. Bicester, Dec. 1941 ; 2.9.1944.
Xylaria hypoxylon (L. ex Fr.) Grev. Bicester, 7.11.1938.
Daldinia concentrica (Bolt. ex Fr.) Ces. & de Not. Bicester, 8.10.1949.
Hypoxylon fuscum (Pers. ex Fr.) Fr. Stonesfield, March 1942.

Lasiosphaeriaceae

Lasiosphaeria ovina (Fr.) Ces. & de Not. Bicester, Aug. 1945.

Diatrypaceae

Diatrype bullata (Hoffm. ex Fr.) Fr. on willow, Bicester, 5.5.1942.
Diatrypella favacea (Fr.) Ces. & de Not. on hazel, Stonesfield, April 1942.

Malayan Orchid Hybrids.*—This book contains photographic illustrations in monochrome of more than 150 hybrid orchids which have been raised in Singapore or are commonly grown there ; almost all are derived from parent species native in the Malayan region. The brief test accompanying each photograph gives the following particulars : parentage and place of origin, a concise description giving essential dimensions and colour-notes, and information as to behaviour in cultivation in Malaya. In almost all cases there is a photograph of a single flower and also a habit photograph showing a complete inflorescence. Where more than one variety of a cross is in general cultivation, each variety is described, and in several cases separately photographed. The photographs are of a high standard and are excellently reproduced on art paper ; the frontispiece shows a colour photograph of Vanda " Tan Chay Yan ".

Each main section of the book is also provided with a well illustrated and concise introductory statement on methods of cultivation used in Singapore for the group of orchids in question ; these cultural notes cover the genus *Dendrobium*, the climbing orchids of the *Vanda-Arachnis* group of genera, the strap-leaved *Vandas*, *Cypripedium* and *Spathoglottis*.

The book will be indispensable to all orchid-growers in Malaya and neighbouring countries, and will be of considerable value also to growers in other tropical regions. It should help considerably in stabilizing nomenclature in this group of cultivated plants, to which fresh additions are constantly being made. It is much to be hoped that supplements may be issued from time to time, to illustrate new hybrids as they appear.

The text has been carefully prepared, and no important errors have been noted. One which occurs more than once is the mis-spelling of the name *Renanthera storiei*, which commemorates James Storie ; the specific epithet is wrongly printed *storei*.

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* Malayan Orchid Hybrids, by M. R. Henderson & G. H. Addison. Government Printing Office, Singapore, 1956, pp. iv. + 191, 1 coloured and over 300 monochrome illustrations. Price $21 (Malayan dollars).

AFRICAN ORCHIDS : XXIV.*

V. S. Summerhayes

The present contribution includes descriptions of nine new species as well as various taxonomic and nomenclatural notes. The results of recent researches on the genus *Bulbophyllum* in Tropical Africa make up a considerable part of the paper. The type specimens of all the new species are in the Kew Herbarium.

Cynorchis (sect. **Hemiperis**) **anacamptoides** *Kraenzl.* in Engl. Bot. Jahrb. **22,** 18 (1895).

Stenoglottis calcarata Rchb. f. in Flora, **48,** 180 (1865).

Barlaea calcarata (Rchb. f.) Rchb. f. in Linnaea, **41,** 54 (1877).

Cynorchis platylepoides Kraenzl. apud Gilg in Engl. Bot. Jahrb. **28,** 367 (1900), sphalm. *platyclinoides.*

C. micrantha Schltr. in Engl. Bot. Jahrb. **53,** 488 (Oct. 1915), non (Frapp. ex Cordem.) Schltr. (Aug. 1915).

C. gymnadenoides Schltr. l.c. 489 (1915).

C. barlaea Schltr. l.c. 489 (1915), in obs.

Examination of the type specimens of the above concepts (except of *C. platyclinoides*) and of over 60 other gatherings has convinced me that they are conspecific. The species cannot bear the earliest epithet *calcarata* owing to the existence of *C. calcarata* (Thou.) Dur. & Schinz, based on *Amphorchis calcarata* Thou., and therefore the epithet *anacamptoides* has to be adopted.

The species exhibits a considerable range of variation in the number, size and shape of the leaves, in the general stature of the plant and in the number of flowers in the inflorescence. The floral characters are also somewhat variable, as might be expected in such a widely ranging species, but the general floral pattern is remarkably constant. The labellum is always quite entire, shortly ligulate in shape and about the same length as or often slightly longer than the spur. The papillose middle lobe of the rostellum is about the same height as the anther loculi but sometimes slightly overtops them ; rarely it is distinctly shorter.

C. anacamptoides has a wide distribution in Tropical Africa occurring on the mountain in Fernando Po and in East Africa from the eastern Belgian Congo, Uganda and Kenya Colony southwards to Southern Rhodesia. It also occurs in Angola, from which country, however, I have seen only the gathering made by Welwitsch.

The epithet *platyclinoides*, proposed by Kraenzlin for Goetze's no. 224 from the Uluguru Mts., is clearly an unintentional orthographic error for *platylepoides*. Kraenzlin compares his plant with " Platyclinis glandulosa Rchb. f. " which is evidently a mistake for *Platylepis glandulosa* Rchb. f., a well-known African terrestrial species. On the other hand the genus *Platyclinis*, now usually considered as a section of *Dendrochilum*, consists of epiphytic plants of a totally different appearance with well-developed pseudobulbs and plicate leaves.

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* Continued from K.B. 1956, 236.

Cynorchis (sect. **Hemiperis**) **anisoloba** *Summerhayes*, sp. nov. ; affinis *C. hanningtonii* Rolfe et *C. rungweensis* Schltr., ab illa labelli lobis tribus distalibus a lobis lateralibus basalibus distantibus, lobis basalibus brevibus triangularibus vel rotundatis, ovario magis glanduloso-pubescente, ab hac floribus majoribus, labelli lobis lateralibus distalibus linearibus vel oblongis obtusis satis differt.

Herba terrestris vel ad truncos *Cyathearum* epiphytica, 15–30 cm. alta ; tuber ellipsoideum, circiter 2 cm. longum et 1 cm. diametro, lanuginosum. *Caulis* erectus vel adscendens, basi vaginis paucis membranaceis obtectus 1–2-foliatus, supra folios vaginis 2–4 distantibus interdum foliaceis lanceolatis acuminatis usque ad 3 cm. longis instructus, sparse vel sparsiuscule glanduloso-pubescens, in inflorescentiam terminans, teres, inferne 1–2 mm. diametro. *Folia* adscendentia vel patentia, lanceolata, oblongo-lanceolata, oblanceolata vel late lanceolata, basi vaginantia, apice breviter acuminata, 4–12 cm. longa, 1–3 cm. lata, chartacea, subtus interdum purpureo-tincta. *Inflorescentia* simpliciter racemosa, sub-laxe multiflora, 6–15 cm. longa ; rhachis ± dense glanduloso-pubescens, teres vel leviter angulata ; bracteae lanceolatae, acutae vel acuminatae, usque ad 1 cm. longae, floribus breviores, sparse glanduloso-pubescentes vel fere glabrae. *Flores* arcuatim patentes, lilacini vel roseo-lilacini ; pedicellus cum ovario 6–8 mm. longus, ± dense glanduloso-pubescens. *Sepalum* intermedium erectum vel ± incurvatum, valde convexum, late ovatum, apice obtusissimum, 3·5–5 mm. longum, 3–4 mm. latum, trinervium ; sepala lateralia deflexim patentia, semi-orbicularia vel obovato-semi-orbicularia, apice lateraliter rotundata, 5·5–7 mm. longa, 3–3·5 mm. lata, plurinervia ; omnia sepala extra ± sparse glanduloso-pubescentia. *Petala* cum sepalo intermedio galeam formantia, e basi angusta falcatim lanceolata vel oblanceolata, apice obtusa, margine anteriore prope basin cum columna adnata, 3·5–5·2 mm. longa, 1·5–2·5 mm. lata, glabra, bi- vel subtrinervia. *Labellum* porrectum, quinquelobum, 6–9·5 mm. longum, basi cum columna adnatum ; lobi basales breves, triangulari vel rotundati, 0·4–0·9 mm. longi, 0·6–1 mm. lati ; lobi laterales a lobis basalibus 1·5–2 mm. distantes, ex intermedio angulo acuto divergentes, lineares vel oblongi, apice rotundati, 2·5–3 mm. longi, 0·5–1·1 mm. lati ; lobus intermedius oblongus vel ligulatus, apice obtusus vel subacutus, 2·5–5 mm. longus, 0·8–1·8 mm. latus ; calcar incurvatum, cylindricum, apice rotundatum haud inflatum, 5·5–10 mm. longum, 0·8–1·4 mm. diametro, basi interdum glanduloso-pubescens. *Columna* brevis, 1–1·5 mm. alta, apice fere truncata ; antherae loculi paralleli, canalibus 1 mm. longis, auriculis (staminodiis) breviter stipitatis oblongis vel obovatis rugulosis ; rostellum porrectum, apice breviter incisum, lobo intermedio fere nullo ; stigmata subclavata, rostello breviora.

Southern Rhodesia. Inyanga Distr., Mt. Inyanga, 2200 m. alt., under shrubs in wood by stream, Feb. 1931, *Norlindh & Weimarck* 5030 ; Melsetter Distr., Chimanimani Mts., 1650 m. alt., Feb. 1954, *Ball* 244 (S.R. Gov. Herb. No. 47903) (type) ; same district, 1500 m. alt., Feb. 1954, *Crook* 540 (S.R. Gov. Herb. No. 46458) ; Manicaland, Mt. Nuza, common, on *Cyathea* trunks and everywhere where ground is sheltered, Jan. 1935, *Gilliland* 1560.

This species is clearly allied to the two species mentioned in the diagnosis. It may be distinguished from the more widely spread *C. hanningtonii* Rolfe by the separation of the front lateral lobes of the labellum from the basal ones by a sort of claw whereas in Rolfe's species the two lobes on each side are separated by a narrow acute sinus only. *C. rungweensis* Schltr., which also has the lateral lobes separated as in *C. anisoloba*, has appreciably smaller flowers while the distal lateral labellum lobes are quite small and triangular-acute.

The present species is known only from the mountains along the eastern border of Southern Rhodesia.

Cynorchis (sect. **Hemiperis**) **hanningtonii** *Rolfe* in Dyer, Fl. Trop. Afr. **7,** 261 (1898).

C. johnsonii Rolfe, l.c. (1898).

Examination of the type specimens of the above two concepts, together with nearly 20 other gatherings, shows that they represent only one species. Both of the original specimens are very poor and the localities in which they were collected are doubtful so that it is a pity that either was described as a new species. On careful consideration I have decided to select the type of *C. hanningtonii* as being the better specimen of the two and therefore to adopt this name for the joint species. It is, however, a little doubtful whether the plant was actually collected by Bishop Hannington since the areas in which he collected all lie considerably to the north of any other recorded locality for the species.

Vegetatively plants referable to the species show considerable variation not only in the size of the plants and of the leaves but also in the number of leaves, which in some gatherings are always two in number whereas in other gatherings all the plants have a single leaf only. I have, however, been unable to correlate any other differences with the number of the leaves. The character used by Rolfe in his key in the Flora of Tropical Africa, that is, the amount of glandular pubescence present, is quite a variable one and in any case the type specimens themselves do not agree with the difference stated in the key !

As regards the floral characters the labellum is always 5-lobed, the lowest pair of lobes being quite short, but the length and shape of the other three lobes show very great variation from one specimen to another. In several gatherings from Southern Rhodesia which are, I think, referable to the species the distal pair of lateral lobes are exceptionally short and the middle lobe rather broad and emarginate, but plants with short lateral lobes are also found in other areas. It is, however, possible that these Southern Rhodesian plants are better looked upon as a distinct subspecies. The spur varies widely in length, even in plants from the same gathering, ranging between 3 and 10 mm., but is always narrowly cylindrical with no thickened portions. As I now understand the species it occurs in southern Tanganyika Territory, the Katanga district of the Belgian Congo, Nyasaland and Northern and Southern Rhodesia.

Habenaria (sect. **Diphyllae**) **perpulchra** *Kraenzl.* in Engl. Bot. Jahrb. **51,** 373 (1914).

H. platymera Schltr. in Engl. Bot. Jahrb. **53,** 502 (1915).

On examination of the type gatherings of the above two concepts it is evident that they are conspecific. The labellum segments in *H. perpulchra* are a little broader than in *H. platymera* but there is considerable variation in this respect between flowers on different plants in the same gathering. This also applies to the size of the flowers and the petal-segments. In general floral structure and in vegetative characters there is close agreement between the two gatherings. In addition to the two type gatherings which came from the Belgian Congo and southern Tanganyika Territory respectively, I have seen specimens from Northern Rhodesia collected by Mr. D. B. Fanshawe.

Habenaria (sect. **Diphyllae**) **stenoceras** *Summerhayes*, sp. nov. ; affinis *H. lelyi* Summerh. et *H. vaginatae* A. Rich., ab illa labelli lobo intermedio lineari-ligulato obtuso, ab hac floribus duplo majoribus, ab utraque calcari 6–8 cm. longo facile distinguitur.—*H. lelyi* var. *macroceras* Summerh. in Kew Bull. **1938,** 148.

Herba terrestris, 25–35 cm. alta, radicibus exceptis glaberrima. *Tubera* ellipsoidea vel anguste ovoidea, 1–2·5 cm. longa, 8–10 mm. diametro, ut radices flexuosae dense tomentosa. *Folium* unum, basale, humistratum, late orbiculare vel fere reniforme, apice breviter apiculatum vel rotundatum, 2–3 cm. longum, 3–4 cm. latum, ± carnosum, marginibus saepius breviter recurvatis. *Scapus* erectus, superne 4–10-florus ; pedunculus teres vel leviter angulatus, 1–3 mm. diametro, cataphyllis 5–7 lanceolatis basi vaginantibus apice acutis 2–3 cm. longis distantibus instructus ; rhachis leviter flexuosa, teres ; bracteae lanceolatae, acuminatae, 1·5–2 cm. longae, ovario pedicellato breviores. *Flores* arcuatim suberecti vel adscendentes, albi ; pedicellus cum ovario arcuatus, 2–2·5 cm. longus. *Sepalum* intermedium erectum vel leviter incurvatum, lanceolato-ellipticum, apice breviter apiculatum, 6–8 mm. longum, 3–4 mm. latum, convexum ; sepala lateralia patentia vel deflexa, curvatim oblongo-lanceolata vel lanceolata, obtusa, 7–9 mm. longa, 2·8–3·6 mm. lata ; omnia sepala subquinquenervia. *Petala* cum sepalo intermedio agglutinata, erecta, oblique lanceolata, apice obtusa, 6·5–7·5 mm. longa, 2·5–3 mm. lata, tri- vel subquinquenervia. *Labellum* deflexum, e basi integra 2–3·5 mm. longa tripartitum, partitionibus divergentibus, totum 7·5–11·5 mm. longum ; partitio intermedia lineari-ligulata, apice obtusa, 7–8 mm. longa, 1·2–1·7 mm. lata, trinervia ; partitiones laterales intermedia similes sed angustiores, 6–7·5 mm. longae, nervis obscuris ; calcar dependens, anguste cylindricum, prope apicem levissime inflatum tantum, 6–8 cm. longum. *Anthera* erecta, 2·5–3·7 mm. alta, apice apiculata, loculis parallelis, canalibus incurvatis 0·5–1 mm. longis, auriculis (staminodiis) curvatim ellipsoideis rugosis ; brachia stigmatifera crasse clavata, apice ± truncata, 1·5–2·5 mm. longa ; rostelli lobus intermedius erectus, anthera brevior, linearis, acutus, papillosus, circiter 1·5 mm. longus.

French Cameroons. Between Ngaou Ndéré and Meiganga, 1938–1939, *Jacques-Félix* 4293.

Oubangui-Shari. Bozoum, July 1931, *Tisserant* 2864 ; Jauja Mts., near Bozoum, 900 m. alt., June 1914, *Mildbraed* 9694.

Belgian Congo. Bas Congo, Mayombe, Luvu, S. of Tshela, in marshy herb savanna on white sand, Dec. 1952, *Callens* 3810 (type).

This species belongs to that group in sect. *Diphyllae* in which the petals are entire. It has, however, a considerably longer spur than any of the other species so far described. In general floral structure the species lies between species like *H. vaginata* A. Rich. in which the flowers are smaller and the spur shorter and species belonging to other groups within the section, such as *H. macrura* Kraenzl., in which, however, the petals are bifid. Our species resembles most closely *H. lelyi* Summerh. from Northern Nigeria but that has a shorter and differently shaped spur and differs in other minor floral characters.

Polystachya (sect. **Affines**) **camaridioides** *Summerhayes*, sp. nov. ; affinis *P. obanensi* Rendle, a qua planta minore, caulibus sub pseudobulbis pro rata elongatis plurifoliatis, pseudobulbo apice monophyllo, inflorescentia brevi, floribus dimidio minoribus glabris satis distinguenda.

Herba epiphytica parva, usque ad 7 cm. alta. *Caules* erecti, inferne cylindracei plurifoliati, apice in pseudobulbo incrassati, superpositi, e praecidentibus sub pseudobulbo apicali exorientes, in toto (pseudobulbo incluso) usque ad 3·5 cm. longi, inferne 3 mm. diametro, pseudobulbis anguste ovoideis vel ellipsoideis leviter longitudinaliter angulatis 8–12 mm. longis 5–7 mm. diametro apice monophyllis. *Folia* patentia ; vagina arcta, leviter compressa, leviter longitudinaliter costulata, usque ad 12 mm. longa ; lamina elliptica vel ligulata, apice fere aequaliter et rotundato-bilobulata, usque ad 3·5 cm. longa et 11 mm. lata, leviter canaliculata. *Inflorescentia* terminalis, breviter paniculata, 1–2 cm. longa, usque ad 10-flora ; pedunculus brevissimus, ut rhachides breviter pubescens ; bracteae suberectae, lanceolatae, acutissimae, usque ad 3·5 mm. longae, ovario pedicellato breviores. *Flores* adscendentes, pallide flavidi vel viridi-flavidi ; pedicellus cum ovario ± arcuatus, 4–5 mm. longus, glaber. *Sepalum* intermedium leviter incurvatum, lanceolatum, acuminatum, 4·5 mm. longum, 2·5 mm. latum, trinervium ; sepala lateralia incurvatim patentia, oblique triangularia, acuminata, margine superiore 7·5–8 mm. longa, basi 5·5 mm. lata, subquadrinervia, cum pede columnae adnata mentum ± rotundato-conicum 4·5 mm. longum formantia. *Petala* oblanceolata, acuta, 3·25 mm. longa, fere 1 mm. lata, uninervia. *Labellum* valde recurvatum, rhomboideo-oblanceolatum, supra medium obscure trilobatum, apice apiculatum, circiter 7 mm. longum et 3·5 mm. latum, disco medio callo rotundato instructum. *Columna* brevis, crassa, circiter 1 mm. longa, androclinio leviter excavato ; anthera hemisphaerica, antice in appendicem brevem obtusam producta, papillosa ; pollinia ellipsoidea, 0·6 mm. longa, stipite brevi crasso, viscidio semi-lunato utroque obtuso.

S. Nigeria. Calabar District, near Calabar, on tall forest trees, July 1955, *J. O. Wright* 101 ; cult. and flowered Royal Botanic Gardens, Kew, July 1956.

This remarkable little species seems most closely allied to *P. obanensis* Rendle and *P. laurentii* De Wildem., and less closely to *P. affinis* Lindl., all of which are characterised by the presence of distinct pseudobulbs. In the other species, however, the part of each annual growth below the pseudobulb is very short and the closely placed nodes bear either cataphylls or a small number of foliage leaves. In the present species, however, the lower part of the annual growth is much elongated bearing as

many as four well spaced-out leaves, while the uppermost internode swells up to form the pseudobulb which bears a single leaf at its apex. The new growth then arises from the axil of the leaf at the base of the pseudobulb, successive stems therefore being superposed much as in sect. *Superpositae*. In the latter section, however, there is no differentiation between stem and pseudobulb, the whole stem often being much swollen.

The growth in the present species is very reminiscent of some species of *Camaridium* (now included in *Maxillaria*) and the specific epithet is given in allusion to this. The inflorescence, which appears to be branched almost from the base, is however terminal on the pseudobulb instead of axillary as in *Maxillaria*.

Bulbophyllum buntingii *Rendle* in Cat. Talb. Nig. Pl. 99, t. 12, fig. 1–3 (1913).

B. ellipticum De Wildem. in Rev. Zool. Afr. **9,** suppl. bot. 29 (1921).

By the courtesy of Prof. W. Robyns I have been able to examine the type specimen of *B. ellipticum* De Wildem., and on comparison with a number of gatherings of *B. buntingii* Rendle it is clear that the two concepts are conspecific.

The type of *B. ellipticum* (*Bequaert* 2496) is in fruit and De Wildeman describes only the sepals, apparently not having seen the remainder of the flower. I was fortunately able to find a flower in which the parts, though withered, were all present and these show that the specimen possesses the lanceolate unguiculate petals with papillose margins so characteristic of *B. buntingii*. The labellum, more or less triangular or almost hastate when spread out with rounded or recurved lateral lobes and a narrow acute point is almost identical with that in specimens of *B. buntingii*. Vegetatively the two agree very closely, as also do the inflorescences in the two plants.

B. buntingii is now known to occur in Liberia (several gatherings), Southern Nigeria, the French and Belgian Congos and Uganda, the Bequaert specimens helping to bridge a rather wide gap in the previously known range.

Bulbophyllum calamarium *Lindl.* in Edw. Bot. Reg. **1843,** misc. 70.

This species was originally described from a plant cultivated by Col. Fielding and said to be of Sierra Leone origin. It should be noted that the hairs on the linear labellum are said to be purple in colour while the bracts equal the ovary in length. There is an unlabelled specimen on the type sheet in the Lindley Herbarium accompanied by three sketches, two in colour, of the flower. These all agree very well with the original description except that the labellum is rather broad for the term " linear " as usually understood. The bracts are 11–12 mm. long, a little longer than the pedicellate ovary. The labellum is characterised by two very dense lines of short hairs on each margin from the swollen base nearly to the apex, the long red hairs arising in the apical part from the under surface of these marginal zones, the upper surface between the margins being quite glabrous. Nothing is said in the original account about the number of flowers open at once but judging from the specimen there were

certainly not more than three and some of these may have been going over when the specimen was picked.

In 1844 the species was figured in the Botanical Magazine (t. 4088) from a plant grown by Mr. Gray of Greenock. It is clear that this is conspecific with the original and shows the same features as mentioned above, namely bracts not exceeding 13 mm. in length and the longer hairs of the labellum in the apical part and arising from the lower surface of the margins.

What I believe to be an error has been introduced into the drawing, however, since 9 flowers are shown to be open simultaneously, no doubt in order to produce a more effective plate. This is an important point since in some species of this alliance (e.g. *B. saltatorium* Lindl. and *B. miniatum* Hort. ex F. W. Moore) most of the flowers in the inflorescence are open at once, whereas in others (e.g. *B. distans* Lindl.) only one, or at the most two, flowers are open at any given time. Many observers state that in these species a single flower opens each day and usually remains open for about 24 hours. Specimens collected in Sierra Leone by Mr. F. C. Deighton and agreeing with the original of *B. calamarium* in all respects are stated definitely by Mr. Deighton to have flowers opening one at a time. Other similar specimens collected in Liberia by Mrs. Harley flower in the same manner. It seems probable, therefore, that this is a specific character of *B. calamarium* in spite of the Botanical Magazine drawing.

In 1862 Lindley himself introduced another source of confusion when, in dealing with several collections of West African orchids, he identified Barter No. 1482 from Nigeria with his *B. calamarium* (Journ. Linn. Soc. Lond. Bot. **6,** 125). Examination of Barter 1482, which is represented in both the Lindley and Hooker Herbaria, shows that it is a distinct species, differing from *B. calamarium* in its stouter growth, larger leaves, much larger bracts (17–22 mm. long) and flatter and broader labellum which has long chocolate-coloured or brown hairs. In fact this specimen agrees very well with the species which was described later as *B. schinzianum* Kraenzl.

In the Flora of Tropical Africa (**7,** 33 : 1897) Rolfe included the two plants confused by Lindley under *B. calamarium*, adding a further specimen from the French Cameroons. This plant also has the large bracts and other features of *B. schinzianum* and the allied *B. phaeopogon*. Finally when I treated the genus for the Flora of West Tropical Africa (**2,** 433, 437 : 1936) I also accepted *B. calamarium* as being a plant with large bracts and grouped it with *B. phaeopogon*, separating it from the latter on floral characters actually derived from the small-bracteate plants !

It is clear, therefore, that *Bulbophyllum calamarium* Lindl. has been misunderstood by all the authors who have dealt with it, and that the concept of the species as presented in the Flora of West Tropical Africa is quite misleading, being derived from a mixture of two species and from incorrect representations of the method of flowering.

Bulbophyllum distans *Lindl.* in Journ. Linn. Soc. Lond. Bot. **6,** 125 (1862).

B. kindtianum De Wildem. Not. Pl. Utiles Congo, 309 (1904).

B. nudiscapum Rolfe in Kew Bull. **1909,** 365.

In the Flora of West Tropical Africa (**2,** 433 : 1936) I separated *B. distans* and *B. kindtianum* on the characters of the pseudobulbs and leaves. With the availability of much more material I find that these differences cannot be maintained, while at the same time the general inflorescence and floral characters are remarkably uniform. *B. distans* may be distinguished from *B. calamarium* Lindl. by the characters of the labellum which is narrower and less fleshy, though with a thick fleshy base, the longer red hairs arising from both surfaces at the margins and sometimes from the centre of the upper surface. As a result the upper surface is usually more or less hidden or covered by the hairs. The base of the labellum in many, though not all, specimens bears a pair of recurved colourless papillose auricles, one on each side, just above the point of attachment to the column.

Bulbophyllum modicum *Summerhayes*, sp. nov. ; affine *B. josephi* (Kuntze) Summerh., a quo foliis brevissime petiolatis, floribus minoribus purpureis et albis nec aurantiacis satis differt.

Herba epiphytica, 10–20 cm. alta, glaberrima. *Rhizoma* repens, teres, circiter 2 mm. diametro, sub pseudobulbi radices flexuosas ramosas numerosas emittens. *Pseudobulbi* minus 1 cm. distantes, ovoidei vel conico-ovoidei, compressi et obscure 3-angulati, 1·3–2·3 cm. longi, 1–1·7 cm. lati, pallide lutei vel luteo-virides, minute rugulosi, basi cataphyllis scariosis instructi, apice monophylli. *Folia* erecta, brevipetiolata, ligulata, apice rotundata brevissime bilobulata vel retusa, basi in petiolum 5 mm. longum angustata, 9–12 cm. longa, 11–16 mm. lata, supra secus medium canaliculatum, subtus nervo prominulo, tenuiter coriacea. *Scapus* erectus, 10–20 cm. altus, folium superans, multiflorus ; pedunculus gracilis, teres, 5–8 cm. longus, circiter 1 mm. diametro, vaginis circiter 5 laxiusculis subacutis scariosis instructus ; rhachis gracilis, obtuse angulata ; bracteae lanceolatae, subacutae, scariosae, usque ad 4·5 mm. longae, ovario pedicellato breviores. *Flores* patentes vel ± reflexi, partim rubro-purpurei, partim albi, glabri ; pedicellus cum ovario 3–5 mm. longus. *Sepalum* intermedium anguste triangulari-lanceolatum, acutum, 6–7 mm. longum, circiter 1·5 mm. latum, subtrinervium ; sepala lateralia intermedio similia sed latiora, obliqua, circiter 7 mm. longa et 2·25 mm. lata, binervia ; omnia sepala superne rubro-purpurea, basi alba. *Petala* leviter curvatim lanceolato-oblonga, acuta, circiter 2·75 mm. longa et 1·2 mm. lata, uninervia, prope apicem marginibus papillosis. *Labellum* recurvatum, lanceolato-ovatum, apice obtusum, supra late concavum vel canaliculatum, circiter 2·25 mm. longum, 1 mm. latum, rubro-purpureum, subtus album. *Columna* porrecta, 1–1·2 mm. longa, sectio semi-teres, pallide viridis, stelidiis acutissimis 0·75 mm. longis ; anthera breviter bilobata, antice truncata, papillosa.

British Cameroons. Buea, 900 m. alt., on tree, 1947, *Gregory* 193 (type) ; same locality, coll. 1952, cult. and flowered Royal Botanic Gardens, Kew, Jan. 1955, *Gregory* 558 ; same locality, coll. H. Gregory 1947, cult. and flowered Ibadan, Oct. 1949, *Keay* FHI.25439.

This not very striking species is clearly allied to *B. josephi* (Kuntze) Summerh. which occurs in the same region and was also collected by

Miss Gregory. It differs in the much shorter petioles to the leaves and the smaller flowers, which are quite differently coloured. Both species have a quite glabrous labellum and a column in which the stelidia are relatively short.

Bulbophyllum nigritianum *Rendle* in Cat. Talb. Nig. Pl. 99, t. 12, fig. 4–5 (1913).

B. albidum De Wildem. in Rev. Zool. Afr. **9,** suppl. bot. 27 (1921), non (Wight) Hook. f.

B. africanum A. D. Hawkes in Lloydia, **19,** 92, (1956).

Comparison of the type specimens of the above two concepts shows them to be clearly conspecific. The species is characterised by the relatively narrow leaves, dense inflorescence with very short peduncle, the trilobed labellum with ciliate lateral lobes and the forward-directed tooth on the column below each stelidium. *B. nigritianum* is now known to occur in Sierra Leone, Liberia, the Gold Coast, Southern Nigeria and the eastern Belgian Congo and is probably distributed throughout the extensive Congo Forest area.

Bulbophyllum porphyroglossum *Kraenzl.* in Engl. Bot. Jahrb. **22,** 24 (1895).

B. leucopogon Kraenzl. in Engl. Bot. Jahrb. **48,** 391 (1912).

Examination of the type gatherings of the above two concepts shows that they are conspecific. Both came from the French Cameroons but Kraenzlin makes no reference to his earlier species when describing *B. leucopogon.* The two epithets suggest that the labellum is differently coloured in the two specimens but there is no real evidence for this since no colour notes were supplied by the collector in the case of *B. leucopogon.* A plant cultivated some years ago at the Royal Botanic Gardens, Kew, which is clearly referable to *B. porphyroglossum,* is described as having a purple labellum covered with white hairs and thus combines the characters indicated by the two epithets.

The species is related to *B. pavimentatum* Lindl., but differs in the more pointed narrower leaves, the denser inflorescence with a relatively shorter peduncle and the less fleshy flowers with narrower more acute quite glabrous sepals.

Bulbophyllum schinzianum *Kraenzl.* in Bull. Soc. Bot. Belg. **38,** 57 (1900).

B. gentilii Rolfe in Gard. Chron. ser. 3, **36,** 266 (1904).

Examination of the type specimens of the above two concepts, and of a number of other gatherings, fails to reveal any essential differences between them. Rolfe distinguishes his species from *B. schinzianum* on account of the supposed small lateral lobes of the labellum in the latter. This difference is really imaginary and is the result of different ways of describing the labellum. In all members of this group the base of the labellum is rather swollen, sometimes very much so, and the hairy upright edges of this swollen part may be interpreted as rather indistinct

rounded lateral lobes. On the other hand the labellum may also be considered to be entire without any true lobes.

B. schinzianum differs from the allied *B. phaeopogon* Schltr. by the shorter petals (4·5–5·2 mm. as against 6·5–7·5 mm.) and the narrower labellum. There may also be differences in the colour of the flowers but the data available are not sufficient to establish this with certainty. From *B. calamarium* Lindl. the species is easily distinguished by the much larger bracts and by the brown hairs arising from both surfaces of the labellum.

Bulbophyllum zenkerianum *Kraenzl.* in Engl. Bot. Jahrb. **48,** 391 (1912).

B. planiaxe J. B. Petersen in Bot. Tidsskr. Copenh. **49,** 166, fig. 8 & 9 (1952).

Examination of the type material of both of the above concepts shows them to be conspecific and, indeed, almost identical. Both type gatherings came from the French Cameroons but, in addition, I have seen material referable to the species from Liberia, British Cameroons, Oubangui-Chari and Northern Rhodesia. These other specimens show that the species varies considerably as regards the size of the vegetative parts and also to a less extent in the flower size. The flower structure, on the other hand, is remarkably constant and very similar to that in *B. oreonastes* Rchb. f.

I am still a little doubtful whether *B. zenkerianum* does not really represent a series of specimens of *B. oreonastes* in which the rhachis is much more strongly winged than usual, with the wings toothed as well as the lower keels on the bracts. *B. oreonastes* itself shows a partial development of entire wings in some specimens whereas in others the rhachis is quite devoid of wings. The labellum in particular, is almost identical in the two species and quite different from that in the allied *B. fuscum* Lindl.

Bulbophyllum (sect. **Megaclinium**) **calyptratum** *Kraenzl.* in Engl. Bot. Jahrb. **22,** 24 (1895).

Megaclinium lindleyi Rolfe in Dyer, Fl. Trop. Afr. **7,** 43 (1897).

Bulbophyllum lindleyi (Rolfe) Schltr., Die Orchid. 327 (1914).

Megaclinium lepturum Kraenzl. in Ann. Nat. Hofmus. Wien, **30,** 61 (1916).

In the Flora of West Tropical Africa (**2,** 437 : 1936) I distinguished *B. lindleyi* from *B. calyptratum* on account of the widened rhachis. Since then, however, evidence has gradually accumulated which suggests that the width of the rhachis is highly variable in many species of sect. *Megaclinium* though there do seem to be some species in which the widened or unwidened rhachis, as the case may be, is a constant character. For some time now I have been doubtful as to the distinctions between the above two species as I had seen material in which, coupled with more or less constant vegetative and floral characters, the rhachis varied from being quite broad (up to 1·5 cm.) to being even more slender than the peduncle and not at all widened. I am therefore left with no alternative but to amalgamate the two species into one which must bear the earlier epithet *calyptratum.*

During the period since the " Flora " was written a number of gatherings have been made which resemble the narrow-rhachis form of the above species but differ in certain respects, particularly the very long narrow leaves. Some specimens with these features were also included under *B. calyptratum* but can now be seen to be distinct. As a result of careful examination I have decided that all these specimens are referable to a distinct species, *B. graminifolium*, which is described below.

As here understood *B. calyptratum* is distributed from Sierra Leone in the West to Gabon in the east ; I have also seen a doubtful specimen from the Belgian Congo.

Bulbophyllum (sect. **Megaclinium**) **congolanum** *Schltr.* in Engl. Bot. Jahrb. **38,** 14 (1905).

Megaclinium clarkei Rolfe in Kew Bull. **1891,** 198.

? *M. eburneum* Pfitz. ex Kraenzl. in Orchis, **2,** 134 (1908).

M. pobeguinii Finet in Lecomte, Not. Syst. **1,** 167 (1910).

Bulbophyllum jespersenii De Wildem. in Bull. Jard. Bot. Brux. **5,** 176 (1916).

B. zobiaense De Wildem., l.c. 178 (1916).

? *B. eburneum* (Pfitz. ex Kraenzl.) De Wildem. Pl. Bequaert. **1,** 85 (1921).

B. pobeguinii (Finet) De Wildem. l.c. 95 (1921).

B. chevalieri De Wildem. l.c. 80 (1921).

Examination and comparison of the type specimens of the above concepts, except that of *M. eburneum* which is destroyed, shows them to be conspecific. The species has to bear the later epithet *congolanum* owing to the existence of *Bulbophyllum clarkei* Rchb. f., an Indian species.

The species shows considerable variation in the length of the scape in comparison with the leaves, the scape being sometimes nearly twice as tall as the pseudobulbs and leaves together, whereas in other plants it is shorter. As in many other species belonging to the section *Megaclinium*, the width of the rhachis varies greatly, the rhachis being sometimes scarcely widened at all ; whether the flowers are borne along a central line or nearer one side is also highly variable. In my opinion neither of these characters is of much value for specific differentiation.

I am a little doubtful about the identity of *M. eburneum* Pfitz. ex Kraenzl. with *B. congolanum* as I have not seen the type, but the original description, so far as it goes, agrees well with the present species. There are two inflorescences in the Kew Herbarium, sent to Rolfe for identification by Dr. Pfitzer in 1904, which agree well with Kraenzlin's subsequent description of *M. eburneum*. These may well be authentic material of that species.

As now understood *B. congolanum* has a wide distribution in the northern part of Tropical Africa, extending from French Guinea in the west to the Sudan and Uganda in the east ; it also occurs in the forests of the Congo Basin. In many respects it resembles *B. oxypterum* Lindl. but that species has broader leaves, while the labellum is pectinate in the lower part.

Bulbophyllum (sect. **Megaclinium**) **graminifolium** *Summerhayes*, sp. nov. ; affine *B. calyptrato* Kraenzl., sed foliis longioribus angustiori-

busque, scapo breviore, floribus nec reflexis, sepalo dorsali pro rata breviore, columna distincte longiore satis distinguitur.

Herba epiphytica, sub anthesi ad 45 cm. alta. *Rhizoma* repens, teres, 2–4 mm. diametro, primo cataphyllis vaginantibus laxe indutum, sub pseudobulbis radices multiramosas flexuosas tenues emittens. *Pseudobulbi* 1–3 cm. distantes, erecti, conico-cylindracei, anguste conici vel conico-ovoidei, ± applanati vel obtuse 3–4-angulati, 1–5 cm. longi, 0·5–2 cm. diametro, apice diphylli, juniores vaginis scariosis eis fere aequilongis fere omnino obtecti. *Folia* linearia, graminiformia, apice obscure obtuse bilobulata, basi angustata sed vix petiolata, 9–32 cm. longa, 3–10 mm. lata, superne leviter canaliculata, subtus nervo prominente, tenuiter coriacea. *Scapus* erectus, 10–28 cm. longus ; pedunculus teres, 5–13 cm. longus, basi 1–2·5 mm. diametro, vaginis 4–6 vix imbricantibus acutis 7–15 mm. longis scariosis arctis (siccitate laxis) instructus ; rhachis multiflora, teres, levissime fractiflexa, breviter nigro-pubescens ; bracteae reflexae, lanceolatae, acutae, 3–6 mm. longae, scariosae, glabrae. *Flores* adscendentes vel ± incurvatae, nec reflexae, virides vel albido-virides, interdum labello et sepalorum lateralium basi roseo- vel rubro-tincto ; pedicellus cum ovario arcuatim incurvatus, 3–5 mm. longus, brevissime nigro-pubescens. *Sepalum* intermedium erectum vel incurvatum, spathulatum, apice obtusum, saepius apiculatum, 6–7·5 mm. longum, superne 2–3 mm. latum, dimidio superiore utrinque secus margines carnoso-incrassatum saturate viride, quinquenervium ; sepala lateralia oblique vel curvatim ovato-triangularia, apice acuta, dimidio superiore valde recurvata, 4·5–7 mm. longa, basi 2·7–3·5 mm. lata, trinervia, cum pede columnae adnata mentum rotundatum formantia ; omnia sepala extra sparse nigro-puberula. *Petala* curvatim oblonga vel lanceolato-oblonga, obtusa vel subacuta, 1·7–2·6 mm. longa, 0·4–0·8 mm. lata, uninervia. *Labellum* valde recurvatum, secus medium carnosum, lanceolato-ligulatum, apice et basi rotundatum, circiter 2·5–3 mm. longum, 1–1·5 mm. latum, trinervium. *Columna* erecta vel leviter incurvata, 1·7–2·2 mm. alta, stelidiis brevibus triangularibus acutis, sub stelidiis obtusissime angulata nec lobulata, androclinio excavato, filamento triangulari acuto ; anthera hemisphaerica vel breviter galeata, antice truncata ; fovea stigmatica transverse oblonga vel quadrata.

French Guinea. Faranah, Bembaya, Feb. 1909, *Chevalier* 20670.

Sierra Leone. Musaia, fairly common in orchard bush and forest, Feb. 1946, *Deighton* 4273 ; Seli R. crossing, Kamadugu chiefdom, coll. R. R. Glanville, cult. & flowered Njala, Feb. 1952, *Deighton* 5744 (type) ; Karina, on *Parkia subglobosa*, coll. T. S. Jones, cult. and flowered Njala, Feb. 1952, *Deighton* 5745.

Liberia. Western Prov., Kolahun Distr., Vahun, on *Cola* tree, sterile, Nov. 1947, *Baldwin* 10173 ; Vonjama Distr., Soplima, sterile, Nov. 1947, *Baldwin* 10036 ; Repula, Dec. 1954, *Harley* 1950 ; Ganta, Nov. 1954, *Harley* 2064.

Gold Coast. Aburi, in high trees among moss, etc., Nov. 1898, *Johnson* 217 ; Agogo, on fallen forest tree, Nov. 1932, *Gillett* 7 ; Osiem, near Tafo, Nov. 1952, *Westwood* 62 ; Efiduase, Feb. 1937, *Cox* 20 ; Awaso, *Blayney* 20, cult. & flowered Kew, Feb. 1949.

This species is clearly allied to *B. calyptratum* Kraenzl. but differs in a number of features. All the specimens seen have a narrow unwidened rhachis but this may not necessarily be a constant character.

The most striking difference from its ally is in the leaves which are much longer and narrower than in *B. calyptratum*. Measurements show that on the average the leaves in *B. graminifolium* are about 45 times as long as broad (26–80 times in different examples) whereas in *B. calyptratum* the corresponding figures are 17 (varying from 10–33). On the other hand the scape is longer in *B. calyptratum*, varying from 16–43 cm. in length with an average of about 28 cm., whereas in *B. graminifolium* the average length is only 19 cm. varying from 10–28 cm. Another interesting difference between the species is that in *B. calyptratum* the flowers become reflexed some time after opening whereas in *B. graminifolium* they always remain in an upright more or less incurved position. In detailed floral structure there are also several differences though the general construction is remarkably similar in the two species. The most obvious difference is in the intermediate sepal which, relatively to the lateral sepals, is distinctly shorter in *B. graminifolium* than in *B. calyptratum* and therefore does not stand out so clearly from the rest of the flower. This difference is enhanced by the incurved position of this sepal in the former species whereas in *B. calyptratum* it is often straight or even slightly bent backwards. On the other hand the column is a little longer in *B. graminifolium* than in its ally.

It is interesting to note that while the broad-rhachis form of *B. calyptratum* occurs throughout the range of the species the narrow-rhachis form occurs only from Nigeria eastwards. West of this it is apparently replaced by *B. graminifolium*, also with a narrow rhachis.

Bulbophyllum (sect. **Megaclinium**) **lucifugum** *Summerhayes*, sp. nov. ; a *B. calyptrato* Kraenzl. pseudobulbis ovoideis leviter angulatis, foliis longioribus, inflorescentia ab luce aversa, rhachide latiore marginibus crenulatis satis differt.

Herba epiphytica ; rhizoma repens, crassiusculum, teres, 3–4 mm. diametro, sub pseudobulbis radices flexuosas ramosas graciles emittens. *Pseudobulbi* circiter 4 cm. distantes, erecti, ovoidei vel conico-ovoidei, obscure pluriangulati, 2–4 cm. longi, inferne 1–2·3 cm. diametro, basi cataphyllis duobus membranaceis vestiti, apice diphylli. *Folia* linearia, apice obtusa vel subacuta vix bilobata, basi leviter angustata, 20–24 cm. longa, 6–9 mm. lata, tenuiter coriacea, supra anguste canaliculata, subtus nervo prominulo. *Inflorescentia* e basi pseudobulbi exorta, primo horizontalis, deinde deorsum valde recurvata ab luce aversa ; pedunculus 4–5 cm. longus, teres, circiter 2 mm. diametro, vaginis circiter 4 apice acutis fere omnino obtectus ; rhachis valde applanata, foliacea, oblonga vel elliptico-oblonga, marginibus crenulatis, 4–7·5 cm. longa, 1·5–2 cm. lata, medio pallide viridis, prope margines albida, purpureo-maculata et brunneo-pilosa ; bracteae medianae, e basi lata triangulares, reflexae, 3–4 mm. longae, basi quam rhachide multo angustiores. *Flores* lateraliter incurvati, fere sessiles, 6–8 mm. distantes ; ovarium arcuatum, 6-costatum, 3–5 mm. longum, pilis brunneis instructum, viride, roseo-tinctum et purpureo-maculatum. *Sepalum* intermedium leviter incurvatum, spathulato-oblongum, apice obtusum vel leviter emarginatum

utrinque valde incrassatum, 6·5–7 mm. longum, superne 3·5–4·5 mm. latum, apice flavum purpureo-notatum, inferne albidum, 5-nervium ; sepala lateralia oblique lanceolato-ovata, apice acuminata, dimidio superiore valde recurvata, 5–5·5 mm. longa, 3·5–4 mm. lata, 4-nervia ; omnia sepala extra viridia roseo-tincta, purpureo-notata, pilis brunneis instructa. *Petala* basi cum columna adnata, curvatim oblongo-ovata, subacuta, 1·5 mm. longa, 0·75 mm. lata, uninervia. *Labellum* valde recurvatum, triangulari-ovatum, laeve, ecallosum, explanatum circiter 3·5 mm. longum, inferne dense purpureo-notatum, dimidio apicali purpureum. *Columna* leviter incurvata, semi-teres, 1·5–2 mm. alta, stelidiis brevibus triangularibus 0·3–0·4 mm. longis, androclinio excavato ; anthera apice crista rugosa instructa, antice emarginata.

Sierra Leone. Makali, Kunike Barima chiefdom, in forest, cult. and flowered Njala, Nov. 1946, *Deighton* 4377 (type) ; Gegbwema, Tunkia chiefdom, cult. and flowered Njala, Dec. 1954, *Deighton* 6154.

This otherwise characteristic member of the section *Megaclinium* is remarkable for the direction of growth of the scape. The scape starts growth in a horizontal direction along the surface of the substratum, from the base of the preceding pseudobulb much as would a new section of the rhizome. Growth continues so until the edge of the supporting substratum is reached when the peduncle curves back abruptly beneath so as to take the rhachis away from the direction of the light. The specific epithet is given in allusion to this behaviour of the scape.

The species is clearly related to *B. calyptratum* Kraenzl. from which it differs by the characters given in the diagnosis. Mr. Deighton tells me that in the vegetative state the species resembles closely *B. graminifolium* Summerh., with which it is also allied, but that species has a very different rhachis and is not such a robust plant.

Bulbophyllum (sect. **Megaclinium**) **maximum** (*Lindl.*) *Rchb. f.* in Walp. Ann. **6,** 259 (1861).

Megaclinium maximum Lindl. Gen. & Sp. Orch. Pl. 47 (1830).

M. djumaense De Wildem. Not. Pl. Utiles Congo, **1,** 124 (1903).

Bulbophyllum djumaense (De Wildem.) De Wildem. Pl. Bequaert. **1,** 83 (1921), et var. *grandifolium* De Wildem., l.c. (1921).

Comparison of the type specimens of the above two concepts, and of many other gatherings in the Kew herbarium, shows that they are conspecific. De Wildeman distinguished his species from *B. maximum* on account of the size of the vegetative parts and inflorescence and also the abruptly narrowed apex of the rhachis. Examination of the type specimen of *B. maximum* shows, however, that the rhachis ends just as abruptly as in *B. djumaense* and De Wildeman was clearly led astray by the incorrect drawing in Bot. Mag. t. 5936. As regards the size of the parts there are gatherings at Kew which show that all intermediates may occur in these respects between the two original type specimens. De Wildeman tacitly acknowledged this by creating at a later date (see above) a variety *grandifolium* of his *B. djumaense*, which variety agrees in all vegetative and inflorescence measurements with material of *B. maximum*.

The species may be recognised by the rather broad and parallel-sided rhachis which is much crinkled and wavy at the margins and usually

narrows quite abruptly at the apex into a sharp apiculus. In many other species of the group the rhachis is gradually narrowed for some distance at each end and particularly towards the apex. The amount of purple spotting both on the rhachis and on the flowers themselves varies from plant to plant and in some cases the colour may be an almost self-coloured purple or maroon.

Bulbophyllum (sect. **Megaclinium**) **oxypterum** (*Lindl.*) *Rchb. f.* in Walp. Ann. **6,** 258 (1861).

Megaclinium oxypterum Lindl. in Edw. Bot. Reg. **25,** misc. 14 (1839).

Bulbophyllum ciliatum Schltr. in Engl. Bot. Jahrb. **38,** 156 (1906), non (Bl.) Lindl.

B. nyassanum Schltr. l.c. **53,** 571 (1915) ; Mansf. in Fedde, Repert. Spec. Nov. Beih. **68,** t. 68, no. 270 (1932).

In the Flora of West Tropical Africa (**2,** 439 : 1936) I reduced *B. oxypterum* to *B. maximum* (Lindl.) Rchb. f. as I thought that it was merely a yellow-flowered form of that species. Since then much more material of this group has been collected, not only in West but also in East Africa, which shows that two allied species exist. These differ mainly in the nature of the rhachis but also in minor floral characters. In *B. maximum* the rhachis is broad (usually over 1 cm.) more or less the same width all along, with markedly crinkled or undulate margins which are also somewhat crenulate, and suddenly terminating in a short acute point at the apex. The labellum does not narrow very much in front while the sepals are very abruptly acuminate and reflexed or recurved. In *B. oxypterum*, on the other hand, the rhachis is narrower, rarely exceeding 1 cm. in width, and tapers markedly at both ends, the apex terminating in a rather thickened long blunt point. The margins are scarcely crinkled and merely slightly sinuate, never really crenulate. The labellum is much narrowed in front and usually markedly recurved, while the sepals are not so abruptly narrowed in the upper part as in *B. maximum*

The colour of the flowers and rhachis in both species is usually of purple spots or blotches on a greenish ground, but sometimes both rhachis and sepals are almost self-coloured purple or blackish-purple ; rarely the rhachis is green. There seems to be no real evidence that the original plant of *B. oxypterum* had flowers of different colour from that described above although Lindley nowhere mentions what the colour was. The idea of yellow flowers was obtained from specimens collected in Principe by Barter (no. 2026) which were referred to *B. oxypterum* by Lindley himself. It is a little doubtful, however, whether these plants are correctly referred to this species. They may well belong to a third species, allied to both *B. oxypterum* and *B. maximum*, but until more material can be obtained from Principe the question will have to be left open.

B. ciliatum Schltr., which I also previously referred to *B. maximum*, is clearly conspecific with *B. oxypterum*, while the eastern *B. nyassanum*, described originally from Tanganyika Territory but now known to be widely distributed in East Africa, is also referable to *B. oxypterum*.

Bulbophyllum (sect. **Megaclinium**) **parvum** *Summerhayes*, sp. nov. ; a *B. rhizophorae* Lindl. planta minuta, pseudobulbis ovoideis approximatis, foliis brevioribus, inflorescentiis paucifloris, labello ellipticoovato, columnae alis angustioribus acutioribusque satis differt.

Herba minuta, epiphytica, usque ad fere 2 cm. alta. *Pseudobulbi* approximati vel usque ad 4 mm. distantes, ovoidei vel ellipsoideoovoidei, compressi sed non angulati, 6–8 mm. longi et lati, apice diphylli. *Folia* anguste elliptica, apice rotundata brevissime tridentata, 6–9 mm. longa, 3–4 mm. lata, supra leviter concava, tenuiter coriacea. *Scapus* e basi pseudobulbi exortus, rectus vel leviter curvatus, 1·2–1·6 cm. altus, dimidio vel triente apicali floriferus ; pedunculus teres, vaginis 3–4 arctis leviter ancipitibus acutis fere omnino vestitus ; rhachis obtuse angulata, pilis nigro-rubris furfuraceis sparse instructa ; bracteae lanceolatae, acutae, scariosae, 2–3 mm. longae, 1·5–2 mm. latae, dorso humiliter carinatae, pilis nigris furfuraceis instructae. *Flores* secundi, distichi, arcuatim conniventes, sessiles, purpurei ; ovarium 1·5–2 mm. longum, pluriangulatum, pilis nigris furfuraceis indutum. *Sepalum* intermedium incurvatum, lanceolatum, acutum, circiter 3·5 mm. longum et 1 mm. latum ; sepala lateralia oblique curvatim triangulari-ovata, acuminata, 3–3·5 mm. longa, circiter 1·75 mm. lata ; omnia sepala trinervia, pilis nigris furfuraceis sparse instructa. *Petala* linearia, versus apicem sensim angustata, subfalcata, acuta, 2–2·5 mm. longa, inferne 0·25 mm. lata, glabra, uninervia. *Labellum* recurvatum, elliptico-ovatum vel ovatum, apice rotundatum, circiter 1·5 mm. longum et 1 mm. latum, trinervium ; unguis angustissimus, 0·2–0·3 mm. longus. *Columna* erecta, 1·3 mm. alta, stelidiis obtusis brevissimis, alis latiusculis apice liberis oblongis subacutis, pede 1 mm. longo ; anthera hemisphaerica, antice in appendicem brevem acutam producta.

Sierra Leone. Picket Hill, near Sugar Loaf, 690 m. alt., on a dead tree, among lichens, Nov. 1951, *Jones* 235 (type).

This little species is clearly related to *B. rhizophorae* Lindl. and *B. falcipetalum* Lindl. but is a much smaller plant with smaller broader pseudobulbs and relatively broader leaves. The floral structure is very similar to that in *B. rhizophorae* but the labellum is relatively broader while the free ends of the wings of the column are narrower and more acute. Unlike both of its allies, which appear to be restricted to coastal mangrove swamps, the present species occurs high up on the Sugar Loaf range near Freetown.

Bulbophyllum (sect. **Megaclinium**) **renkinianum** (*M. Laurent*) *De Wildem.* Pl. Bequaert. **1,** 95 (1921), desc. ampl.

Megaclinium renkinianum M. Laurent in Bull. Agric. Congo Belge, **5,** 210 (1914).

Bulbophyllum cercoglossum Summerh. in Kew Bull. **1953,** 584 (1954).

When I described *B. cercoglossum* I quite overlooked the earlier *B. renkinianum*. On examination of the type specimens of the two concepts it is clear that these are conspecific. The description of the flowers of *B. renkinianum* made by De Wildeman from a cultivated plant, confirms the identity of the two. The species is characterised by the very broad but relatively short rhachis and the long acumen or cauda of the labellum.

Bulbophyllum (sect. **Megaclinium**) **rhizophorae** *Lindl.* in Journ. Linn. Soc. Lond. Bot. **6,** 125 (1862).

B. rubro-violaceum De Wildem. in Rev. Zool. Afr. **9,** suppl. bot. 32 (1921).

Examination of the type specimens of the above two concepts shows clearly that they are conspecific. The pseudobulbs are broader and the leaves shorter in *Bequaert* 6705 than in the plant described by Lindley but I have seen other plants from West Africa with vegetative characters agreeing well with the Belgian Congo material. As regards the floral structure the two specimens agree very well. It is difficult to see on what grounds De Wildeman described his species as " espèce du groupe du *B. cochleatum* Lindl."

B. rhizophorae, although clearly referable to sect. *Megaclinium* on account of the floral structure, in several respects approaches other members of the genus *Bulbophyllum* in Africa. The rhachis is practically never flattened, nor are the lateral sepals reflexed in the upper half as in most members of the section.

Genyorchis apertiflora *Summerhayes*, sp. nov. ; a *G. pumila* (Sw.) Schltr. floribus majoribus et magis apertis, labelli lobo intermedio apice distincte libero, columnae alis (stelidiis) ± recurvatis satis distinguenda.

Herba epiphytica, usque ad 8 cm. alta, radicibus exceptis glaberrima ; rhizoma repens, teres, gracile, vix 1 mm. diametro, sub pseudobulbis radices flexuosas albidas puberulas emittens. *Pseudobulbi* circiter 2 cm. distantes, erecti vel adscendentes, ellipsoidei, leviter compressi, 10–12 mm. longi, 4–7 mm. diametro, laeves, apice diphylli, basi vaginis tenuibus scariosis instructi. *Folia* divergentia vel patentia, oblonga vel elliptico-oblonga, apice rotundata, brevissime inaequaliter bilobulata, supra leviter canaliculata, 11–23 mm. longa, 5–7 mm. lata. *Inflorescentia* e basi pseudobulbi exoriens, circiter 8 cm. longa, apice circiter 5-flora ; pedunculus fere filiformis, 7 cm. longus, circiter 0·5 mm. diametro, vaginis circiter 4 arctis subacutis instructus ; rhachis pedunculo similis, leviter flexuosa ; bracteae ovatae, acutae, circiter 3 mm. longae, ovarium valde superantes. *Flores* sessiles, patentes, pro genere aperti ; ovarium 1·75 mm. longum. *Sepalum* intermedium leviter incurvatum, lanceolato-ovatum, acutum vel fere breviter acuminatum, convexum, 4·2 mm. longum, 2·6 mm. latum ; sepala lateralia subpatentia, oblique triangulari-ovata, breviter acuminata, margine inferiore 4·2 mm. longa, margine superiore 5·7 mm. longa, basi 4·3 mm. lata, cum pede columnae adnata mentum conico-rotundatum 3 mm. longum formantia ; omnia sepala trinervia, alba. *Petala* minuta, triangulari-deltoidea, circiter 0·3 mm. longa. *Labellum* leviter recurvatum, pallide flavidum, ambitu ellipticum sed marginibus erectis, in toto 4·5 mm. longum, apice breviter trilobatum ; lobi laterales erecti, rotundati, papillosi ; lobus intermedius valde recurvatus, rotundato-dentiformis, dimidio apicali liber. *Columna* erecta, circiter 1·5 mm. alta, semi-teres, basi in pedem longiorem producta, alis (stelidiis) leviter recurvatis lanceolatis subacutis ; androclinium reclinatum ; anthera late hemisphaerica, antice in appendicem latam truncatam denticulatam producta ; pollinia non visa ; fovea stigmatica orbicularis, rostello dentiformi leviter producto.

Southern Nigeria. Ondo Prov., Idanre Hills, Orosun, near summit, 900 m. alt., on moss-covered scrubby *Erythroxylum*, Oct. 1949 ; fl. at Ibadan, Nov. 1949, *Keay* FHI. 25545 (type).

This very characteristic looking species differs from the other species in its more open flowers, which are also larger than in *G. pumila* (Sw.) Schltr. though not so large as in *G. macrantha* Summerh. described below. It may also be distinguished by the end of the recurved middle lobe of the labellum being free for some distance from the lower surface of the labellum, whereas in other species this lobe is almost entirely adnate. The very slender peduncle is also noteworthy, as well as the short rhachis.

Genyorchis macrantha *Summerhayes*, sp. nov. ; a *G. pumila* (Sw.) Schltr. floribus majoribus, labelli apice recurvato multo majore fere orbiculari, columnae alis apice brevioribus inferne deltoideis satis differt.

Herba epiphytica, usque ad 7 cm. alta, radicibus exceptis glaberrima ; rhizoma repens, ramosum, gracile, teres sed longitudinaliter sulcatum, circiter 1 mm. diametro, sub pseudobulbis radices numerosas flexuosas albidas breviter tomentosas emittens. *Pseudobulbi* 0·5–2 cm. distantes, erecti, ovoidei, ellipsoidei vel conico-ovoidei, obtuse 4-angulati, 1–2 cm. longi, 4–10 mm. diametro, virides, siccitate flavidi, apice diphylli. *Folia* divergentia, ligulata vel oblongo-ligulata, apice rotundata emarginata, basi leviter angustata, 1–3 cm. longa, 3–7 mm. lata, rigidula, viridia, supra nitida, nervo supra impresso subtus prominulo. *Inflorescentia* e basi pseudobulbi exoriens, simpliciter racemosa, erecta, usque ad 6·5 cm. longa, dimidio vel triente superiore usque ad 7-flora ; pedunculus usque ad 3·5 cm. longus, gracilis, teres, vaginis 4–5 arctis inferioribus imbricatis acutis instructus ; rhachis leviter fractiflexa, leviter angulata ; bracteae ovatae vel lanceolatae, acutae, 2–4 mm. longae, ovarium vix pedicellatum valde superantes, scariosae. *Flores* patentes, non-resupinati, albi vel pallide albido-rosei ; ovarium fere sessile, 1 mm. longum. *Sepalum* intermedium leviter incurvatum, oblongo-lanceolatum, acutum, circiter 4·5 mm. longum et 2·5 mm. latum, convexum, uninervium ; sepala lateralia oblique triangulari-lanceolata, margine superiore basi dilatata apice acuta, margine inferiore 5·2 mm. longa, basi 4 mm. lata, trinervia, cum pede columnae adnata mentum obtuse conicum vel rotundatum circiter 3 mm. longum formantia. *Petala* minuta, transverse oblonga, obtuse apiculata, 0·5 mm. longa, 1 mm. lata. *Labellum* incurvatum, ambitu oblongo-ellipticum, sectio U-forme, in toto fere 5 mm. longum, roseum, apice breviter trilobatum, lobis lateralibus brevibus rotundatis, lobo intermedio multo majore, valde recurvato cum labelli faciei dorsali omnino adnato fere orbiculari antice ruguloso flavido, basi callo orbiculari humili instructum. *Columna* erecta, circiter 2·5 mm. alta, dimidio superiore alis deltoideis vix antheram superantibus instructa, viridi-alba, roseotincta, basi in pedem aequilongam decurrens ; androclinium reclinatum, leviter excavatum ; anthera in appendicem quadratam antice truncatam denticulatam producta ; pollinia 4, ovoideo-ellipsoidea, 2 majora 2 minora ; fovea stigmatica reniformis, rostello obtuso vix producto.

British Cameroons. Cameroon Mt., S. side, Mann's Spring, 2260 m. alt., on tree-trunk on margin of mist-forest, April 1948, *Brenan & Richards* 9570 (type).

This interesting species has the largest flowers so far recorded in the genus but is otherwise very typical in its general features. The labellum is remarkable in that the recurved middle lobe, which in most species is very small and tooth-like, is here expanded into a large almost orbicular structure adnate as usual to the lower surface of the labellum. The wings of the column are also different in shape from the other species which I have seen, being scarcely produced at all above the androclinium, but instead having a large deltoid-shaped projection on each side of the stigmatic cavity.

Eulophia ischna *Summerhayes*, nom. nov.

E. macra Schltr. in Warb. Kun.-Samb. Exped. 217 (1903), non Ridl. (1886).

Owing to the previous use of the epithet *macra* for a Madagascan species it cannot be adopted for the Tropical African species mentioned here. I therefore propose the epithet *ischna* which is the Greek equivalent of the Latin word *macra*.

The species, which was originally described from south-western Angola, is now known to occur in the province of Moxico, in Northern Rhodesia, in the Katanga district of the Belgian Congo, and in southern Tanganyika Territory.

Eulophia lindiana *Kraenzl.* in Engl. Bot. Jahrb. **51,** 388 (1914).

E. lindiana is very similar in general features to *E. penduliflora* Kraenzl. but it differs in the slightly smaller flowers with narrower more acute petals and in the shape and outgrowths on the labellum. In *E. lindiana* the lateral lobes are smaller than in *E. penduliflora* while the middle lobe is longer than broad and very much crisped at the margins ; the outgrowths consist of interrupted lamellae or quadrate flattened calli along the nerves in place of the slender hair-like papillae present in *E. penduliflora*. It is possible that further discoveries may prove these two types to be variants of one species, but there is as yet insufficient evidence for this view.

In addition to occurring in southern Tanganyika, Nyasaland, and Southern Rhodesia, *E. lindiana* has also been found on three occasions in Northern Nigeria, in Zaria and Bauchi Provinces. There is thus a gap of over 2,000 miles between the known areas of the species in West and East Africa respectively.

Eulophia parvula (*Rendle*) *Summerhayes*, comb. nov.

Lissochilus parvulus Rendle in Journ. Bot. Lond. **33,** 196 (1895).

Eulophia tanganyikae Kraenzl. in Bull. Soc. Bot. Belg. **38,** 216 (1900).

E. ledermannii Kraenzl. in Engl. Bot. Jahrb. **48,** 394 (1912).

When I published my views on the group to which this species belongs (Kew Bull. **1953,** 153–156) I decided to treat this concept as conspecific with *E. pyrophila* (Rchb. f.) Summerh. Further investigation, with information about the two plants in the field, has, however, led me to the view that it is better kept separate, as I had at first thought probable.

E. parvula may be distinguished by the smaller flowers, the thickening of the calli to form a verrucose mass just in front of the spur opening and the shorter column which is said by Mr. F. C. Greatrex always to be deep wine-purple in colour in Southern Rhodesian plants. I have not been able to confirm that this colour is constant throughout the species.

As understood here *E. parvula* is distributed from the French Cameroons through the Belgian Congo and Uganda to north-western Kenya Colony and the southern Sudan and also in Nyasaland and the two Rhodesias. *E. pyrophila*, on the other hand occurs in the Sudan, Uganda, much of Kenya Colony, and southwards through Tanganyika and Nyasaland to Southern Rhodesia. It clearly has a more eastern distribution than *E. parvula*, not having been found in the Belgian Congo or Northern Rhodesia.

Eulophia penduliflora *Kraenzl.* in Engl. Bot. Jahrb. **30,** 288 (1901).

E. nana Schltr. in Engl. Bot. Jahrb. **53,** 579 (1915).

On examination and comparison of the type specimens of the above two concepts, both represented at Kew by photographs and flowers, I fail to find any differences between them. Schlechter states that his *E. nana* differs from *E. penduliflora* in the shape of labellum but they appear almost identical in this respect so far as I can see. *E. penduliflora* occurs in southern Tanganyika, in the Katanga district of the Belgian Congo, in Nyasaland and in Southern Rhodesia. The differences between *E. penduliflora* and *E. lindiana* Kraenzl. are mentioned above under the latter species.

Gladioli and Dahlias.*—A second edition of this little book on these two popular flowers has recently been published. The author has been occupied with the development of these plants for some years and his book forms a guide to their cultivation. The first six chapters deal with the cultivation of the Gladiolus, the next four with the Dahlia, and the last with the compost heap. The book is well illustrated, provided with lists of recommended varieties and separate indexes for each flower.

H. S. Marshall.

* Gladioli and Dahlias. By Chas. W. J. Unwin. Pp. 128, illus. London : W. H. & L. Collingridge Ltd., New York : Transatlantic Arts Inc. Revised edition, 1956. Price 10/6d.

NEW OR INTERESTING RECORDS OF AUSTRALASIAN BASIDIOMYCETES : III.

Derek A. Reid

TREMELLALES

Heterochaete discolor (*Berk. & Br.*) *Petch* in Ann. R. bot. Gdn. Peradeniya **9,** 137, (1924).

Kneiffia discolor Berk. & Br. in J. Linn. Soc. (Bot.) **14,** 62, (1873).

Heterochaete tonkiniana Pat. in Bull. Herb. Boissier **1,** 301, (1893). [fide Bodman].

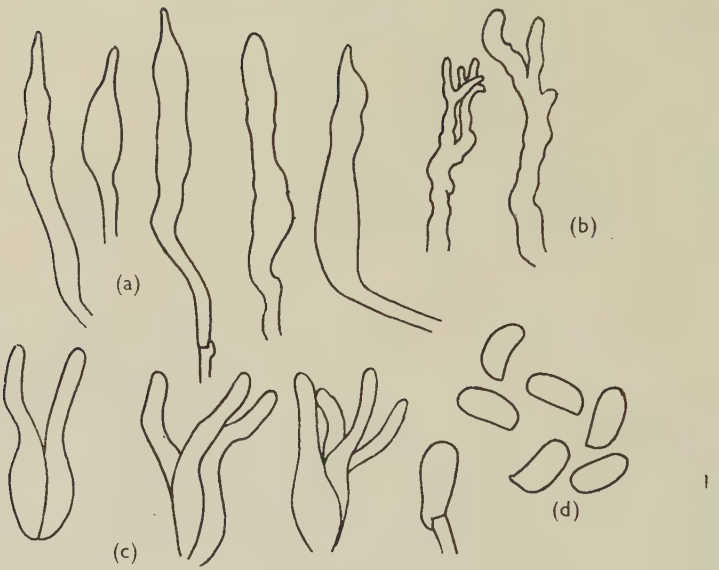
Fructification broadly effused, with distinct margin which is either thin and byssoid or thick and cottony on different parts of the same specimen. Often a compound structure results from the fusion of adjacent fruitbodies and forms irregular, adnate, beige coloured patches, up to 8 cm. in length, covered with minute spines (visible only under a lens). When fresh the sporophore is lilac with a white margin (Petch 1914). *Structure* monomitic. There is a dense basal layer of horizontal, yellowish-brown, branched, thick-walled hyphae, 2-3μ in diameter, with distinct lumena, but lacking clamps at the septa, which gradually become more or less vertically orientated and loosely entwined. These hyphae give rise to the thin-walled, colourless, branched, subhymenial hyphae, 2–2·5μ in diameter, which lack clamps. The sterile hymenial spines arise from the basal layer and consist largely of yellowish-brown hyphae, with thickened walls. *Gloeocystidia* long, cylindrical, hyaline, 18·2–52 × 4·5–7μ, with obtuse or acute apices. *Paraphyses* hyaline, branched structures, 3–4μ in diameter. *Basidia* 2 to 4-spored, ovate, 13–14 × 7–9μ, with a clamp visible at the base when young. *Spores* hyaline, allantoid, 9–11 × 4·5–5·5μ.

Australia : On *Hedycarya angustifolia*, Tarra Valley, Victoria, *N. E. M. Walters*, 14.9.1955 [Herb. F.P.S.M. No. 5613]. This is the first Australian record of *H. discolor*.

Bodman (1952) states that this species has " a distinctly gelatinous hymenium, and a brownish, gelatinous, somewhat amorphous subhymenium ". There is, however, no indication of this in either the Australian or type collections. It is unfortunate that Bodman did not examine authentic material of this species, and merely appears to have relied on the description of Petch (1924) and on G. W. Martin's notes concerning two of Petch's specimens. The type collection has abundant clavate gloeocystidia and allantoid spores, 10–11·5 × 4·5–5μ.

Heterochaete cheesmanii *Wakefield* in Bull. Misc. Inf. Kew 373, (1915).

In her paper on *Heterochaete*, Bodman (1952) writes of this species " Martin states that the teeth are brittle and apparently detached. If they are crystalline the species does not belong in this genus ". The present author has examined the type collection of this fungus, which was from Moruya, New South Wales, and finds that the teeth are not crystalline. He has also confirmed the presence of clamps on the thick-walled, yellowish, basal hyphae, as indicated in the original description.



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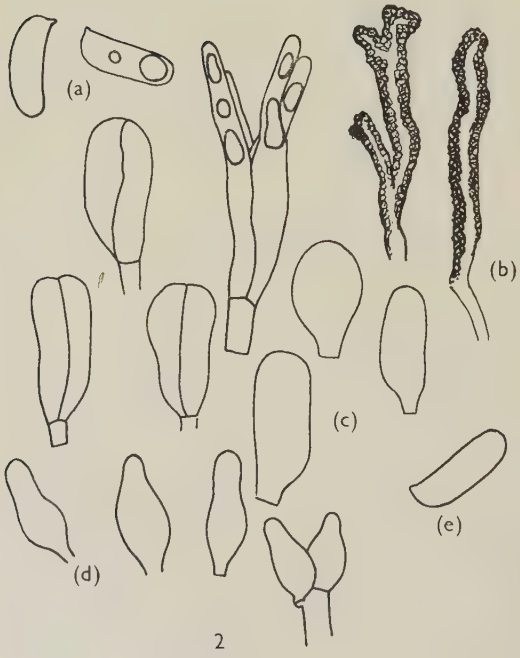

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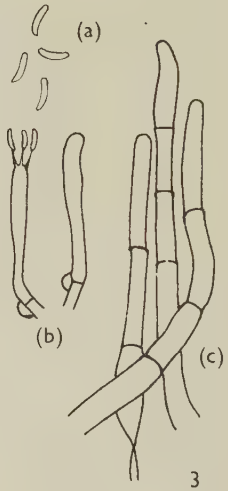

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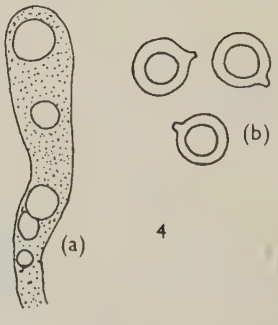

4

In addition it should be noted that there are conspicuous branched paraphyses in the hymenium.

Eichleriella spinulosa (*Berk. & Curt.*) *Burt* in Ann. Mo. Bot. Gdn. **2,** 747, (1915).

Radulum spinulosum Berk. & Curt. in Grevillea **1,** 146, (1873).

Irpex depauperatus Massee in Bull. Misc. Inf. Kew 157, (1901). [Non *I. depauperatus* Berk. & Br. in J. Linn. Soc. (Bot.) **14,** 61, (1873).]

Fructification forming a resupinate, adnate, irregular, pinkish-beige patch, 2 cm. long and 0.8 cm. wide, with a white tomentose margin ; the surface covered with minute needle-like spines. *Structure* monomitic, consisting of branched generative hyphae, 2·5–5μ in diameter, becoming thick-walled and pale brownish in the basal portion of the fruitbody, whilst retaining distinct lumena. A section through the sporophore shows a basal layer in which the hyphae are more or less horizontal, but these gradually give way to others with vertical orientation. These vertical hyphae of the context are strongly encrusted with a deposit which is soluble in potassium hydroxide, and similar sterile, branched, encrusted hyphae are also present in the hymenium. This region of vertical hyphae is followed by a very sharply defined zone, 13μ in width, which is formed of narrow, thin-walled, densely and horizontally arranged hyphae. It is from this zone that the hymenium is formed. The needle-like processes projecting from the hymenial surface also arise from this same zone or more rarely from the uppermost regions of the underlying tissue. These spines, which consist of rather wavy, more or less vertical hyphae with somewhat thickened walls, are sterile except occasionally at the extreme base. *Basidia* 4-spored, clavate, longitudinally septate, up to 26μ long, with a basal clamp visible in the immature state when examined under an oil immersion lens. Probasidia varying from cylindrical to broadly ovate. There are also utriform bodies present in the hymenium which may represent very young stages in the development of basidia. *Spores* 13–19 × 5–7μ, hyaline, depressed laterally, almost allantoid, with obtuse rounded ends.

Australia : on *Acacia dealbata*, Sherbrooke, Victoria, *Miss A. Miller*, 17.11.1954 [Herb. F.P.S.M. No. 4996]. This is the first Australian record of *E. spinulosa*.

The Australian material described above has been compared with the type collection of *Radulum spinulosum* (on *Cephalanthus*, Alabama, *Peters* No. 4543) and found to agree well both macroscopically and microscopically. This species, however, does not seem to be the same as that generally named *Eichleriella spinulosa* in Europe and America. Bourdot and Galzin (1928) gave the spore size of *E. spinulosa* as 12–23 × 7–10μ, and that of the basidia as 30–45 × 8–13μ. These measurements are not strictly accurate. The following data were obtained from

Fig. 1. *Heterochaete discolor* (*a*) gloeocystidia, (*b*) paraphyses, (*c*) basidia, (d) spores. All from F.P.S.M. No. 5613. Fig. 2. *Eichleriella spinulosa*. (*a*) spores, (*b*) paraphyses, (*c*) stages in the development of basidia, (*d*) very early stages in development of basidia or sterile elements. All from F.P.S.M. No. 4996. (*e*) spore from the type collection. Fig. 3. *Odontia sudans*. (*a*) spores, (*b*) basidia, (*c*) cystidia. All from F.P.S.M. No. 5032. Fig. 4. *Deflexula fascicularis*. (*a*) basidium, (*b*) spores. Both from F.P.S.M. No. 5622. All × 866.

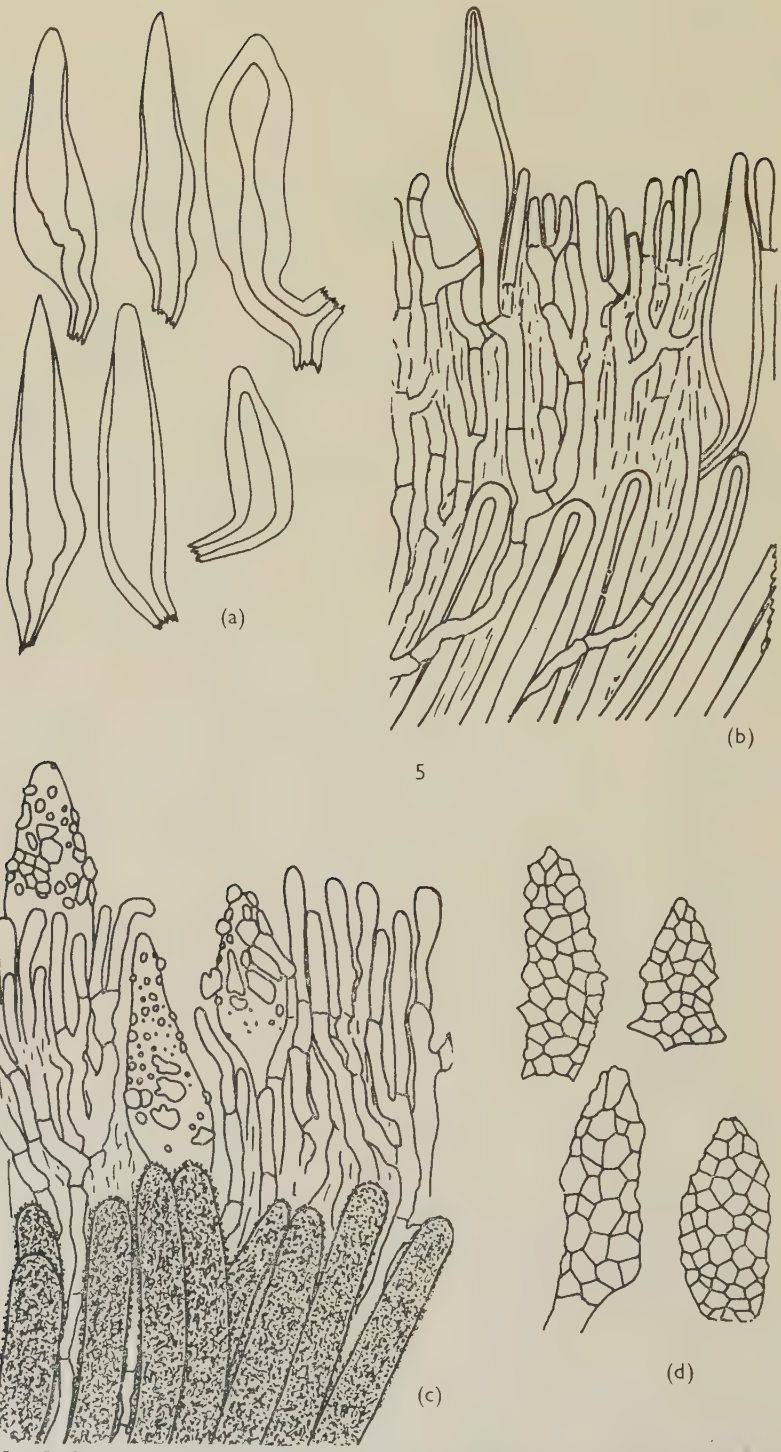

FIG. 5. *Lopharia papyracea*. (*a*) cystidia with encrusting deposit dissolved in potassium hydroxide, (*b*) section through the fruitbody which had been soaked in potassium hydroxide, (*c*) section through the fruitbody which had been soaked in lactic acid, (*d*) cystidia showing the encrusting deposit. All from the type collection and × 866.

examination of twelve British exsiccati :—basidia (23·5–) 25–33 (–46·8) × 8–12μ [one collection only having basidia 33·8–46·8μ in length], spores (14–) 15–18·2 × 6–7·5μ. These measurements agree well with those given by Christiansen (1950) for Danish material (basidia 25–30 × 8–12μ, spores 14·5–17 × 7–9μ). Burt (1915) gave the following data for American material :—basidia 25–36 × 9μ, spores 15–16 × 6μ, whilst Martin (1952) gave the basidia as 19–21 × 8–9μ, and spores (15–) 16–21 × (6–) 7–9μ. The type collection of this fungus, however, has basidia 23–26 × 12μ, and scanty spores 15·6–16 × 6μ. There are very few American collections in the Kew Herbarium referred to this species, but there is one gathering from Priest River, Idaho, July–September 1912, coll. J. R. Weir, which has basidia up to 26μ in length, and abundant spores 14–19 × 4·5–6μ. It is thus apparent that the true *E. spinulosa* has narrower spores and smaller basidia than the European material. In addition the probasidia of the European collections are strongly clavate whilst those of true *E. spinulosa* are cylindrical to broadly ovate. The correct name for the European species thus becomes *Eichleriella deglubens* (Berk. & Br.) Lloyd. In America it is probable that both *E. spinulosa* and *E. deglubens* occur.

Irpex depauperatus Massee was described as having spores 6 × 3–4μ, but examination of the type collection (Tasmania, *Rodway*, 49b.) revealed longitudinally septate basidia up to 26 × 11μ, and spores 19 × 7μ. Bodman (1952) referred this species doubtfully to synonymy under *Heterochaete delicata* (Kl. ex Berk.) Bres. which she records from Australia. Bresadola also stated on the herbarium sheet that this species was the same as *H. delicata*. The type collection of *H. delicata* was examined but no spores or basidia could be found. The structure and macroscopic appearance, however, differed from that of *I. depauperatus* and the basidia of the latter were larger than Bodman's measurements for *H. delicata*. The close agreement in size of the basidia and spores, and also the similarity in hyphal structure with *Eichleriella spinulosa* has led the present author to consider *I. depauperatus* Massee as a synonym of this species. It should be noted that Bodman (loc. cit.) whilst correctly stating that the type locality was Madras, India, proceeded to cite *Copeland* 747 from the Philippine Islands, as the type collection of *H. delicata* in the list of exsiccati which she has examined.

APHYLLOPHORALES

Thelephoraceae

Lopharia papyracea (*Jungh.*) *Reid*, comb. nov.

Thelephora papyracea Jungh. Praemissa in Floram Cryptogamicam Javae Insulae, 36–37, (1838).

Lloydella papyracea (Jungh.) Bres. in Ann. mycol. **8,** 588, (1910).

Fruitbody either resupinate or effuso-reflexed, but easily separable from the substratum. When pileate the fungus forms very thin, long, narrow, coriaceous-membranous brackets. The concentrically sulcate upper surface is frequently unevenly ridged and is covered by a conspicuous beige-coloured tomentum, which forms at least three-quarters of the total thickness. The hymenium, which is often markedly radially ridged and wrinkled, varies in colour from pinkish-buff to very dark

purplish-brown in dried specimens, and is probably purple in the fresh state. *Hyphal Structure* dimitic. The thick-walled unbranched skeletal hyphae, 4·5–8μ in diameter, originate high in the context and curve downwards towards the hymenium forming a palisade-like zone above the subhymenium, which they never penetrate. These almost solid hyphae are encrusted with a fine yellowish-brown granular deposit which is soluble in potassium hydroxide. The branched generative hyphae, 2·5 4μ in diameter, are septate, but lack clamps, and the walls become slightly thickened. There is no distinct cuticle. *Cystidia* arising at different levels in the hymenium or subhymenium, even in the overlying context, and these may never reach the surface, but others project up to 33·8μ. Some are even to be seen amongst the palisade of skeletal hyphae above the subhymenium. These lanceolate organs, 28·6–44·2 × 10–13μ, have colourless walls which become thickened and very strongly encrusted with a coarse hyaline crystalline deposit which is soluble in potassium hydroxide. *Spores* not seen.

Australia : Tropical Queensland, *Bailey*, as *Peniophora papyrina*.

When Junghuhn described *Thelephora papyracea* he gave the type locality as " in silvis montium Kendang (alt. 2000 pedum) ", but it appears that neither of Junghuhn's specimens preserved in the Rijksherbarium, Leiden, can be definitely associated with this locality. One of the specimens with the following typewritten label " Herbarium F. Junghuhn in H.L.B. No. 189, *Thelephora papyracea* nov. spec. (= *Stereum lobatum* Kunze)", bears no resemblance to the original description, and is *Stereum lobatum* as stated. However, the second collection labelled as follows " Herbarium F. Junghuhn in H.L.B. No. 98, *Thelephora papyracea* Jungh. (Stereum) ", agrees well with Junghuhn's description and it is proposed that this should be taken as lectotype.

The Australian collection cited above was named *Peniophora papyrina* and was recorded as such by Cooke (1892) and Cunningham (1953). This species is, however, confined to tropical America and although dried specimens are indistinguishable from *L. papyracea* macroscopically, they have an entirely different structure. Burt (1920) placed great reliance upon whether the cystidia were entirely hyaline or coloured (at least in part) when separating *S. papyrinum* and its allies. In this species the cystidia are dark brown in colour, but sometimes the pigment is localised at the base of these organs, whilst in *L. papyracea* they are usually hyaline. However, this character does not seem very reliable for there is a collection [Herb. F. Currey, Pegu, *J. Kurz* No. 2623] in the Kew Herbarium with the structure of *L. papyracea*, but in which the cystidia are strongly coloured. The main distinction between *L. papyracea* and *S. papyrinum* is that the latter lacks the subhymenial ' palisade ' of encrusted skeletal hyphae.

L. papyracea is widespread in the Pacific and there are specimens at Kew from India, Pakistan, and Burma. It has also been recorded from the Philippine Islands.

Clavariaceae

Deflexula fascicularis (*Bres. & Pat.*) *Corner* Clavaria & Allied Genera, 395–396 (1950).

Pterula fascicularis Bres. & Pat. in Lloyd Mycological Writings **1,** 50, (1901).

Deflexula lilaceo-brunnea Corner Clavaria & Allied Genera, 397–398 (1950).

Deflexula lilaceo-brunnea Corner var. *elongata* Corner in Ann. Bot. **16,** 276 (1952).

Fruitbody consisting of a number of pendulous, caespitose, acute spine-like simple branches, up to 8 mm. in length. When fresh these branches were pale fawn, but have become pale ochraceous on drying. *Basidia* up to 50 × 13μ. *Spores* globose, 9–13·5μ, hyaline, thick-walled, with an apiculus up to 1·5μ long.

AUSTRALIA : on dead standing trunk of *Hedycarya angustifolia*, Tarra Valley, Victoria, *N. E. M. Walters,* 14.9.1955 [Herb. F.P.S.M. No. 5622]. This is the first Australian record of *D. fascicularis.*

For a full description see Corner (1950 & 1952).

Corner (1950) wrote of *D. lilaceo-brunnea* " This species has essentially the same structure as *D. fascicularis* but differs in its smaller, less branched, and differently coloured fruitbodies with larger spores and basidia". He gave the spore size of *D. fascicularis* as 9–10·5 × 9–10μ [Bresadola & Patouillard (1901) gave it as 9–12μ, and Lloyd (1915) 8–10μ] and that of *D. lilaceo-brunnea* as 12–14μ. Later (1952) he listed two of Lloyd's collections of *D. fascicularis* from Samoa with spores 9·5–11·5μ wide, and at the same time he described *D. lilaceo-brunnea* var. *elongata* with spores 11–14μ. An examination of the type collection of *D. lilaceo-brunnea* showed spores 8–10·5μ, with somewhat thickened walls (these data were obtained from five separate fruitbodies). This evidence of the existence of such small spores on the type collection of *D. lilaceo-brunnea* taken with the spore size (9–13·5μ) of the Australian gathering described above shows conclusively that separation of these two species on this character alone is not possible. Corner (1950) gave the size of the basidia of *D. fascicularis* as 25–40 (–50) × 8–11μ, of *D. lilaceo-brunnea* as 50–75 × 15–18μ, and of *D. lilaceo-brunnea* var. *elongata* as 45–60 × 15·17μ[15–17 (?)], whilst the Australian material has basidia up to 50 × 13μ. It would thus appear unwise to base any separation on the size of the basidia, especially as this may depend upon their depth or origin in the thickened hymenium. Again size and degree of branching are very unreliable characters for separation of taxa, so one is left with difference in colour as the only means of separating *D. fascicularis* and *D. lilaceo-brunnea.* The former was said by Corner (1950) to be " white then pale ochraceous, finally pale dingy ochraceous flesh colour ", and the latter " white then yellowish, pale fawn-brown, lilac or subviolaceous ". Whilst *D. lilaceo-brunnea* var. *elongata* was described as " white, then pale ochraceous, finally brownish at the base, never tinged lilac ". There is, therefore, very little distinction even in colour, especially when it is remembered that lilac is a very fugacious tint in many fungi. Consequently these taxa are united under a single species.

HYDNACEAE

Grandinia farinacea (*Pers. ex Fr.*) *Bourd. & Galz.* in Bull. Soc. myc. Fr. **30,** 253, (1914).

Hydnum farinaceum Pers. ex Fr. Syst. Myc. **1,** 419 (1821).

Odontia farinacea (Pers. ex Fr.) Quél. Flore Mycologique de la France, 435, (1888).

Hydnum niveum Pers. ex Fr. Syst. Myc. **1,** 419, (1821).

Odontia nivea (Pers. ex Fr.) Quél. Flore Mycologique de la France, 435, (1888).

Australia : on dead trunk of *Hedycarya angustifolia*, Tarra Valley, Victoria, October 1954 [Herb. F.P.S.M. No. 4899] ; on base of *Phoenix* palm-leaf, Botanic Gardens, Melbourne, 4.10.1955 [Herb. F.P.S.M. No. 5668].

For a full description see Wakefield (1930).

Odontia lyndoniae *Reid* in Kew Bull. 641, (1955).

A New Zealand gathering of this species has been found amongst the unnamed collections of *Hydnum* in the Kew Herbarium, the details of which are as follows :—

New Zealand : *Colenso* (without number).

Odontia sudans (*A. & S. ex Fr.*) *Bres.* in Atti dell J.R.Acc. di Sc. Lett. ed Agiati in Rovereto, Series 3, **3,** (1897).

Hydnum sudans A. & S. ex Fr. Syst. Myc. **1,** 425, (1821).

Thelebolus sudans (A. & S. ex Fr.) Fr. Elenchus Fungorum **2,** 51, (1828).

Dacryobolus sudans (A. & S. ex Fr.) Fr. Summa Veg. Scand. 404 (1849).

Grandinia sudans (A. & S. ex Fr.) Lloyd in Mycological Writings **4,** 741, (1917).

Hydnum agardhii Fr. Syst. Myc. **1,** 418, (1821).

Grandinia agardhii (Fr.) Fr. Epicrisis, 528, (1838).

Porothelium stevensoni Berk. & Br. in Ann. Mag. nat. Hist. Series 5, **1,** 23, (1878).

Porothelium confusum Berk. & Br. in Ann. Mag. nat. Hist. Series 5, **1,** 24, (1878).

Grandinia exudans Karst. in Medd. Soc. Fauna Fl. fenn. **9,** 51, (1882).

Gloeocystidium exudans (Karst.) Karst. in Bidr. Finl. Nat. Folk **48,** 429, (1889).

Fructification resupinate, closely adnate to the substratum, ceraceous, with a minutely pruinose white margin. The hymenial surface, covered by small conical spines, with pale obtuse apices, is beige coloured, suffused with grey. These spines have a resinous-cartilaginous appearance, and in fresh European and American gatherings are often capped by brown viscous droplets. *Hyphal Structure* monomitic, consisting of thin-walled, branched, hyaline hyphae, 2μ in diameter, with clamps at the septa. *Cystidia* up to 156μ long and 2·5–4μ wide, thin-walled, cylindrical with obtuse apices but tapering gradually toward the points of origin from ordinary generative hyphae to which they are joined by a clamp. The cystidia, which are but little differentiated, form the cores of the spines and project from their apices as pale, tapering sterile fas-

cicles. There are a number of secondary septa at intervals along the entire length, which are rather prominent giving the cystidia a jointed appearance. This may be due either to conditions under which the fungus was growing, or to the method of drying, but exactly similar cystidia are present in an American collection from Homestead, Iowa, 26.9.31, det. L. W. Miller. *Basidia* 4-spored, 18·2–25 × 2·5–3μ, clavate, with a basal clamp. *Spores* hyaline, allantoid, 4·5–5·5 × 0·5–1μ. These are slightly smaller than the spores of European and American material (5–8 × 1–1·75μ).

Australia : on *Cassinia aculeata*, Wallaby Creek, Victoria, *D. H. Ashton*, 9.12.1954 [Herb. F.P.S.M. No. 5032]. This is the first Australian record of *O. sudans*.

For additional descriptions see Bourdot & Galzin (1928), Miller (1934), and Christiansen (1953).

Polyporaceae

Polystictus cervino-gilvus (*Jungh.*) *Fr.* Nov. Symb. Myc. 94 (1851).

Polyporus cervino-gilvus Jungh. Praemissa in Floram Cryptogamicam Javae Insulae 45–46, Pl. 9 fig. 24, (1838).

Polyporus dermatodes Lév. Voyage de la Bonite **1,** 180, Pl. 38 fig. 2, (1844–1846).

Trametes dermatodes (Lév.) Lév. in Ann. Sci. nat. Series 3, **2,** 196, (1844).

Polyporus personatus Berk. & Br. in J. Linn. Soc. (Bot.) **14,** 51, (1873).

Polystictus personatus (Berk. & Br.) Cke. in Grevillea **14,** 84, (1886).

Polyporus peradeniae Berk. & Br. in J. Linn. Soc. (Bot.) **14,** 51, (1873).

Polystictus peradeniae (Berk. & Fr.) Cke. in Grevillea **14,** 84, (1886).

Coriolus peradeniae (Berk. & Br.) G. H. Cunn. in Proc. Linn. Soc. N.S.W. **75,** 236 (1950).

Polyporus diversiporus Berk. & Br. in J. Linn. Soc. (Bot.) **14,** 53, (1873).

Poria diversipora (Berk. & Br.) Cke. in Grevillea **14,** 113, (1886).

Polyporus chrysoleucus Kalchbr. in Grevillea **4,** 72, (1875).

Polystictus chrysoleucus (Kalchbr.) Cke. in Grevillea **14,** 82, (1886).

Fruitbody either entirely resupinate or effuso-reflexed or orbicular with a narrow point of attachment. Well developed specimens may reach 11 cm. in length and 4 cm. in width, and frequently consist of a number of imbricate pilei. *Pilei* thin, flexible, and coriaceous. The concentrically sulcate upper surface is tawny-brown and covered by a tomentum—the hyphae of which are united into radial rope-like fibrils of varying prominence. When these fibrils are closely adpressed to the surface, the pileus has a distinct silky lustre. *Pores* angular, 0·5–1 mm. in diameter. When fresh the hymenial surface is salmon-pink, but this fades in herbarium specimens to ochraceous-buff with a pinkish or more rarely olivaceous tint. Petch (1924) wrote " When the hymenium is fully developed the colour changes from yellow or yellow-brown to salmon-pink ". *Tubes* up to 2 mm. in length. *Hyphal Structure* monomitic, consisting of pale yellowish-brown generative hyphae, 4–6μ in diameter. These hyphae, which lack clamps at the septa, branch repeatedly (the

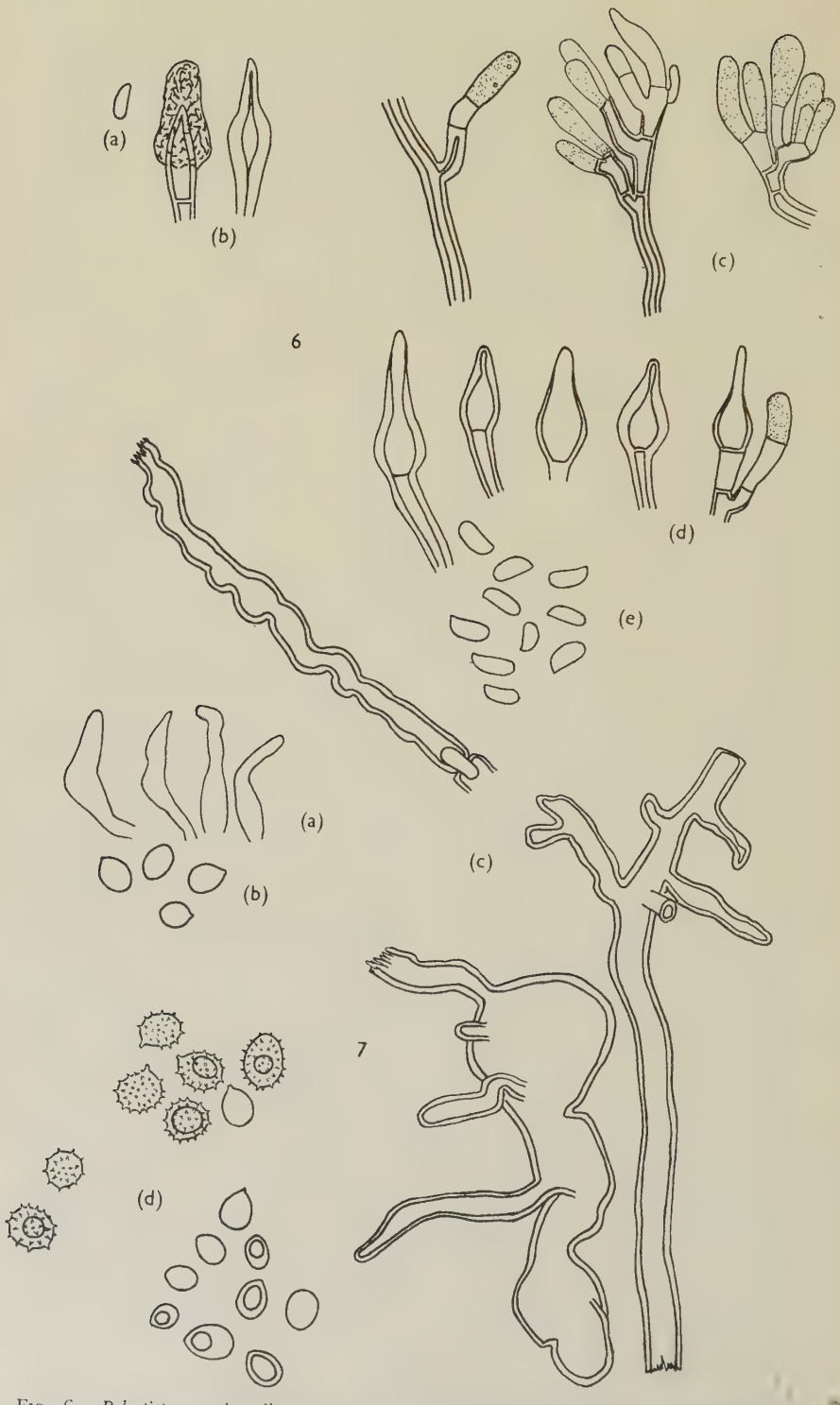

FIG. 6. *Polystictus cervino-gilvus*. (*a*) spore, (*b*) cystidia. From the type collection. (*c*) basidia, (*d*) cystidia with encrusting deposit removed, (*e*) spores. From F.P.S.M. No. 4128. FIG. 7. *Polyporus cretaceus*. (*a*) gloeocystidia, (*b*) spores. From the type collection. (*c*) hyphae, (*d*) spores. From various F.P.S.M. collections. All × 866.

branches may be only 2·5μ wide) and have greatly thickened walls (up to 2μ) except in the actively growing apical portions. Despite this thickening there are well defined lumena. The tomentose surface of the pileus, which lacks a definite cuticular layer, is formed of outwardly growing obtuse hyphal endings. *Cystidia* 15·6–26 (–39) × 8–9μ, becoming thick-walled except towards the apex, and heavily encrusted with a granular deposit which is soluble in potassium hydroxide. These organs, which are more or less lanceolate with swollen bases and long narrow necks, may project up to 25μ above the basidia. *Basidia* 4-spored, clavate 12–18 × 4–5μ. *Spores* hyaline, elliptical 5–8 (–10) × (–2) 2·5–3μ.

Australia : on wood, rotting on the forest floor, Atherton, North Queensland, *E. Volck*, 19.9.1953 [Herb. F.P.S.M. No. 4055] ; on rotting wood, Northern New South Wales, *J. M. Mitchell*, September 1953 [Herb. F.P.S.M. No. 4128].

For a complete list of Australian collections of this fungus preserved in the Kew Herbarium see Cunningham (1950) under *Coriolus peradeniae*.

In addition to the specimens listed above there is an abnormal gathering [Bullahdelah, New South Wales, Ex. Herb. J. B. Cleland No. 26] consisting of an irregularly nodulose sheet of sterile tissue 1·2 cm. in thickness, from the edge of which arise rather thick pilei. Superficially this material looks very different from *P. cervino-gilvus*, but it has exactly the same spores, cystidia and hyphal structure.

When Junghuhn described *Polyporus cervino-gilvus* no type specimen was designated. However, in the Rijksherbarium, Leiden, there is a collection labelled " *Polyporus cervino-gilvus* Jungh., Java, Junghuhn 113 " and with it the following notes " Mai, In silva umbrosa prope Kebokoening ramum dejectum inhabentans." This specimen is a part of that figured by Junghuhn (Pl. 9 fig. 24) and it is therefore proposed that it should be taken as the lectotype.

P. cervino-gilvus is widespread throughout the Pacific and in addition to those from Australia there are collections at Kew from Nilgiris Hills, India, Ceylon, Malaya, Cochin China, Java, the Philippines, and Fiji. This wide distribution is doubtless partly responsible for the extensive synonymy. The type specimens of the synonyms listed above have been examined by the author, but a number of points require elaboration. The type number of *Polyporus diversiporus* consists of two quite distinct species, which differ in pore size and hyphal structure. The specimens with the smaller pores are *P. cervino-gilvus*, but the large pored specimens are trimitic and lack cystidia. Berkeley in his original description of this species stated that the pores were 1/30 inch in diameter, and added " There is a form from the same locality with pores 1/18 inch across ". It is thus clear that Berkeley regarded the small pored form as the normal condition and this must be taken as type. *Polyporus chrysoleucus* Kalchbr. has been listed as a synonym of *Trametes protea* (Berk.) G. H. Cunn. by Cunningham (1950) but it is quite different from this species both macroscopically and structurally. Cunningham (loc. cit.) was also in error when he transferred the monomitic *Polyporus peradeniae* to the genus *Coriolus*, which by his own definition (1948) includes only trimitic species.

In addition to those cited above, *Hexagonia pergamena* Berk. & Br. and *Polyporus zeylanicus* Berk. have also been regarded by authors as synonyms

of *P. cervino-gilvus*. These two species are, however, both trimitic and quite distinct from this fungus.

Polyporus cretaceus *Lloyd* Mycological Writings **4,** 302–303, fig. 640, (1915).

Fruitbodies may be either ungulate or more or less applanate, and when fresh vary in colour from white to buff or grey but become ochraceous or more rarely greyish on drying. The upper surface is glabrous and pitted. *Pores* small (3 per mm.) and angular with very thin dissepiments. They are white to off white in fresh specimens but change to ochraceous or brownish when dried. *Tubes* up to 11 mm. long, concolorous with the pores. *Flesh* pure white, hard, powdering like chalk when scraped. Herbarium specimens have a strong aromatic odour, but a collector's note indicates that this probably develops on drying. *Hyphal Structure* of the context monomitic, consisting of branched generative hyphae with prominent clamps which are often loop-like. The hyphae are very conspicuous even in unstained preparations as the walls are thickened (–2·5μ) and highly refractive, although there is always a distinct lumen. They are often locally inflated (reaching 25μ in diameter) and irregularly constricted, but sometimes the constrictions are more regular giving a beaded appearance. Frequently the hyphal walls are irregularly kinked and wavy. Certain segments of the generative hyphae produce short lateral branches which are aseptate and thick-walled except occasionally at the extreme apex. These lateral branches, which are but rarely themselves branched, might be regarded as rudimentary binding hyphae, but they never develop further to produce branched hyphal complexes. The structure of the dissepiments is rather different from that of the flesh and consists of longitudinally arranged hyphae, 2·5–4μ in diameter, with clamps at the septa. They do not become inflated, neither do they branch in the same way as those forming the flesh. There is no distinct separable cuticle, but in sections through the fruitbody there is a horny line visible at the surface. This is formed of vertical hyphal endings which produce a yellowish zone passing into a region in which the hyphae become strongly gelatinised. *Gloeocystidia* : there are thin-walled irregular bodies present in the hymenium of the type specimen, up to 22 × 6μ, which could be regarded either as gloeocystidia or perhaps as cystidioles. *Spores* as seen in the tubes are broadly elliptical or ovate, 5–7·5 (8·5) × 4–5·5 (–6·5)μ. They are usually smooth, hyaline, non-amyloid, and frequently monoguttulate. However, in the tubes of F.P.S.M. No. 2607 there are, in addition to the smooth basidiospores, others which are up to 9 × 7μ and echinulate. Similar echinulate basidiospores were also found on the cuticle of F.P.S.M. No. 2638 together with smooth ones, and a single echinulate spore of the same size was also seen in the fragment of the type specimen in the Kew Herbarium. These echinulate spores vary from broadly elliptical or ovate to subglobose, and are 8–10 × 6–7μ. It seems most probable, therefore, that the mature spores are spiny, but this can only be decided by examining spore prints.

Australia : on living tree of *Nothofagus cunninghamii*, in high forest country near Acheron Way, Victoria, 1949 [Herb. F.P.S.M. No. 2249] : on trunk of living *Nothofagus cunninghamii*, near Marysville, Victoria, 1950

[Herb. F.P.S.M. No. 2607] ; on the end of a rotting log (? *Nothofagus cunninghamii*) in high mountain ash forest, Acheron Way, Victoria, 1949 [Herb. F.P.S.M. No. 2228] ; on fire scar on living *Eucalyptus regnans* near Marysville, Victoria [Herb. F.P.S.M. No. 2606] ; on dead stump of *Eucalyptus regnans* (mountain ash) Victoria. These are the first records of *P. cretaceus* from the Australian mainland.

A collector's note states that " This species, with its characteristic aroma and radiating chalky context, is fairly common throughout Victoria ".

Tasmania : there is a single specimen labelled by Berkeley " *Polyporus portentosus* Berk., Tasmania " in the Kew Herbarium.

As *P. cretaceus* appears to show some relationship with *P. sulphureus* [Bull.] Fr. it is interesting to compare the anatomy of these fungi. Corner (1953) has given a detailed account of the hyphal structure of *P. sulphureus*, which is a dimitic species in which the flesh consists of generative and binding hyphae. In this fungus the generative hyphae lack clamps, and isolated segments become thick-walled and produce a number of branches. These branches are aseptate and thick-walled except at the apex. If these were to develop no further and all the generative hyphae were to become thick-walled, a similar structure to that of *P. cretaceus* would result. However, in *P. sulphureus* the lateral branches develop into much branched binding hyphae. The construction of the fruitbody of *P. cretaceus* could nevertheless be interpreted as being of a similar but less specialised type to that of *P. sulphureus*.

Cunningham (1950) regarded *P. cretaceus* as a synonym of *P. portentosus* Berk., but he was only able to examine a fragment of the type at Kew, which consists of a very thin slice through the tubes with a minute amount of attached context. *P. cretaceus* differs markedly from *P. portentosus* in its non-separable cuticle, hard chalky flesh, and hyphal structure.

Inonotus rodwayi *Reid*, sp. nov.

Sporophorum imbricatis lobis inaequaliter fissum, superficie superiore pallida demum ochracea vel brunnea, scrobiculata. *Pori* plus minus angulati, 0·5 mm. diametro, griseo-brunnei pruinosi. *Tubuli* usque ad 10 mm. longi. *Substantia* brunnea sed cuticulam versus albida. *Hyphae* 8–12μ diametro, ramosae, septatae, sine fibulis ; muris brunneis crassiusculus. *Setae* 16–26 × 6–9μ, copiosae, brunneae, lanceolatae vel basibus inflatis. *Hyphae Setoideae* acutae, in muris tubulorum, usque ad 13μ diametro. *Sporae* 6–9 × 4·5–6·5μ, laeves, pallide brunneae, late ellipsoideae.

Australia : on *Ficus infectoria*, Abbot St., Cairns, Queensland, March 1945 [Herb. F. A. Rodway No. 14492]. (TYPUS).

Sporophore forming a mass 15 × 11 × 11 cm. consisting of a number of irregularly imbricate lobes with beige coloured, pitted upper surfaces, which become ochraceous or dark brown on the older portions, and show a tendency to radial wrinkling near the obtuse margin. *Pores* irregularly angular, 0·5 mm. in diameter, with a greyish-brown pruinose appearance. *Tubes* forming a single layer, up to 10 mm. in length. *Flesh* snuff-brown

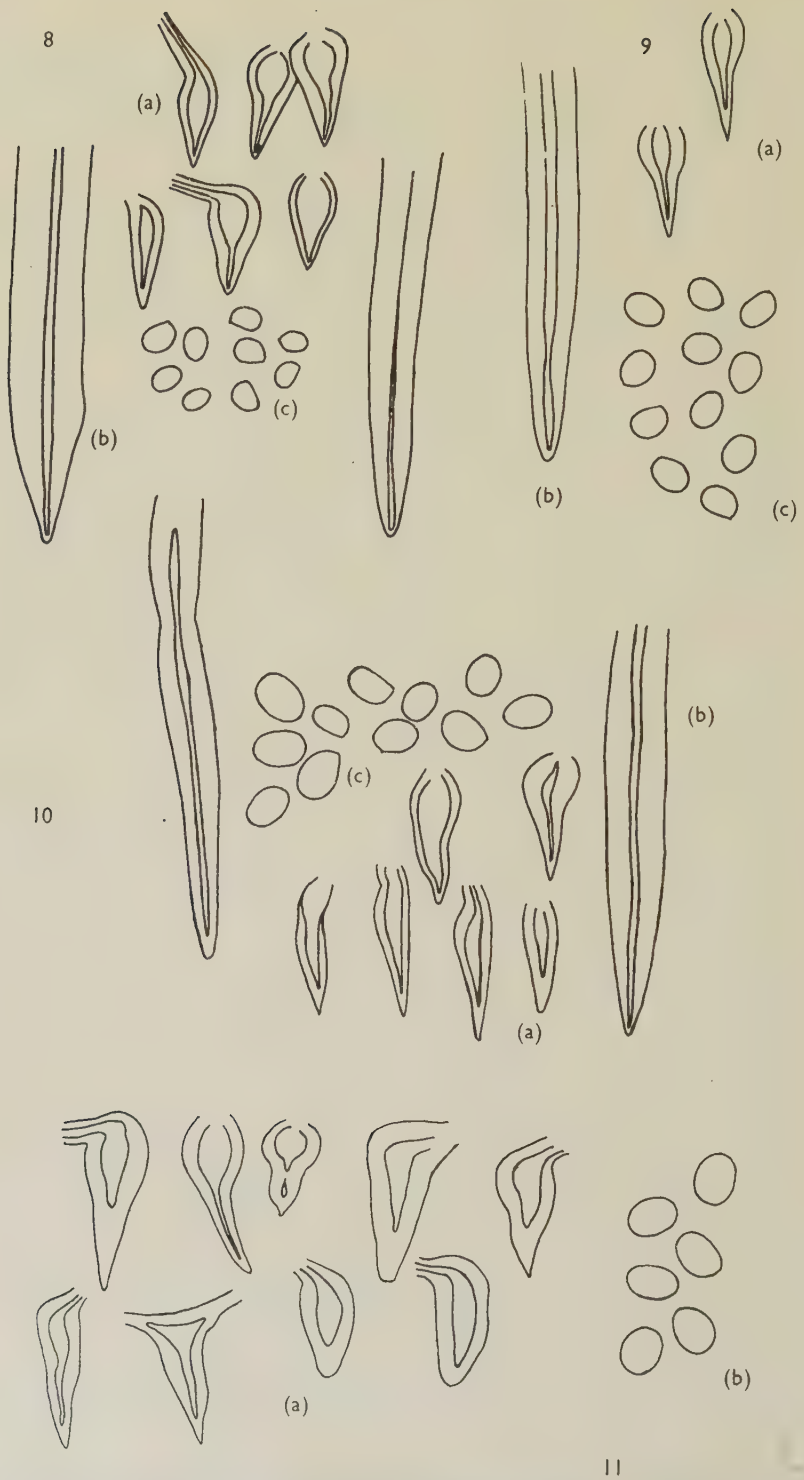

FIG. 8. *Inonotus patouillardii*. (*a*) setae, (*b*) setoid hyphae, (*c*) spores. From an authentic specimen in Herb. Kew. FIG. 9. *Polyporus rickii* f.sp. *negundinis*. (*a*) setae, (*b*) setoid hyphae, (*c*) spores. From an authentic specimen in Herb. Kew. FIG. 10. *Inonotus rodwayi*. (*a*) setae, (*b*) setoid hyphae, (*c*) spores from type collection. FIG. 11. *Polyporus victoriensis*. (*a*) setae, (*b*) spores. All × 866.

but becoming whitish towards the cuticle. When a radial section of the sporophore is examined the flesh can be seen to be concentrically zoned, and to have a satiny sheen. *Hyphal Structure* monomitic, consisting of generative hyphae 8–12μ in diameter, with slightly thickened brown walls and abundant septa, but lacking clamps. These hyphae give rise to septate branches, 3–5μ in diameter, which branch repeatedly. The hyphae forming the whitish zone beneath the cuticle are very pale and almost hyaline, whilst those forming the tubes, although coloured, are 2·5–5μ in diameter. In the older portions of the fruitbody there is a distinct cuticle which shows in section as a dark horny line. This is composed of a layer of highly gelatinised, irregularly distorted, brown hyphae, from which a few nongelatinised hyphal endings protrude. *Setoid Hyphae* abundant in the dissepiments, sometimes diverging and protruding into the tubes themselves. They have very thick walls which become almost black in potassium hydroxide, often taper quite suddenly to an acute apex, and are up to 13μ in width. *Setae* thick-walled, brown, lanceolate, 16—26 × 6–9μ. Spores 6–9 × 4·5–6·5μ, pale brown, broadly elliptical, smooth.

Inonotus rodwayi is very closely related to **Inonotus patouillardii** (*Rick*) *Reid*, comb. nov. [*Polystictus patouillardii* Rick in Broteria **6,** 89, 1907]. An authentic specimen of the latter species presented to Kew by C. G. Lloyd and containing the following note in his handwriting " *Polyporus patouillardii* Rick, received from Rev. Rick, Brazil, June 1918, and so labelled by Rick ", whilst possessing similar setae and setoid hyphae has much smaller spores (4·5–6 × 3·5–4·5μ). **Inonotus rickii** (*Pat.*) *Reid*, comb. nov. [*Xanthochrous rickii* Pat. in Bull. Soc. myc. Fr. **24,** 6–8, 1908] is also very close, differing according to the original description in its smaller spores (6 × 4μ). Wright & Iaconis (1955) described the new taxon " *Polyporus* (*Inonotus*) *rickii* (Pat.) Sacc. & Trott. f.sp. *negundinis* nova forma ", and whilst the term " form species " has obviously been misapplied, this is evidently related to *I. rodwayi*. The taxon was said to have spores "anchamente elipsoidales, algunas con un diminuto apiculo, con o sin gruesa vacuola, 3·6–5·2–7·2 micrones ", setoid hyphae in the tube walls, and to lack setae. However, the specimen deposited in the Kew Herbarium has scanty setae. Lloyd (1921) described *Polyporus victoriensis* and stated that neither spores nor setae were present. Later (1924) he gave a further description based on a second collection from J. B. Cleland (which Cunningham (1950) erroneously cited as type) and stated that the spores were " hyaline, globose, 4 mic., smooth" and again added that there were no setae present. Cleland (1935) writing of this species gave his own spore measurements of this collection as 3·2–3·8μ. The present author has not examined the type, but he has been able to study a portion of the specimen which Cleland sent to Lloyd. This clearly belongs to the genus *Inonotus*, and is closely related to *I. rodwayi*. Contrary to published descriptions this has abundant setae, and although spores were not found in the tubes, pale brown basidiospores 8–9 × 6–8μ were present on the surface of the pileus, and it is assumed that these belong to the fungus. This collection differs from *I. rodwayi* in the lack of setoid hyphae, the irregularly shaped setae, and the slightly larger spores.

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References :

Bresadola, G. & Patouillard, N. (1901). Diagnoses of new species of fungi from Samoa. In Lloyd, C.G. Mycological Writings, Cincinnati, **1,** 49–51.

Bodman, M. C. (1952). A taxonomic study of the genus *Heterochaete*. Lloydia **15,** 193–233.

Bourdot, H. & Galzin, A. (1928). Hyménomycètes de France, Paris.

Burt, E. A. (1915). The Thelephoraceae of North America. V. *Tremellodendron, Eichleriella and Sebacina.* Ann. Mo. bot. Gdn **2,** 731–766.

Burt, E. A. (1920). The Thelephoraceae of North America, XII. *Stereum.* Ann. Mo. bot. Gdn **7,** 81–248.

Christiansen, M. P. (1950). Contributions to the resupinate fungus-flora of Denmark. Friesia **4,** 89–97.

Christiansen, M. P. (1953). Contributions to the resupinate fungus-flora of Denmark. Friesia **4,** 314–338.

Cleland, J. B. (1935). Toadstools and mushrooms and other larger fungi of South Australia, Adelaide, **2,** 179–362.

Cooke, M. C. (1892). Handbook of Australian fungi, London.

Corner, E. J. H. (1950). A monograph of *Clavaria* and allied genera. London.

Corner, E. J. H. (1952). Addenda Clavariacea. I. Ann. Bot., Lond., N.S. **16,** 269–291.

Corner, E. J. H. (1953). The construction of Polypores. I. Phytomorphology **3,** 152–167.

Cunningham, G. H. (1948). New Zealand Polyporaceae. IV. The genus *Coriolus.* Bull. Dep. sci. industr. Res., N.Z. No. 75.

Cunningham, G. H. (1950). Australian Polyporaceae in Herbaria of Royal Botanic Gardens, Kew, and British Museum of Natural History. Proc. Linn. Soc. N.S.W. **75,** 214–249.

Cunningham, G. H. (1953). Revision of Australian & New Zealand species of Thelephoraceae and Hydnaceae in the Herbarium of the Royal Botanic Gardens, Kew. Proc. Linn. Soc. N.S.W. **77,** 275–299.

Lloyd. C. G. (1915). Mycological Writings, Cincinnati, **4,** 532.

Lloyd, C. G. (1921). Mycological Writings, Cincinnati, **6,** 1095.

Lloyd, C. G. (1924). Mycological Writings, Cincinnati, **7,** 1328.

Martin, G. W. (1952). Revision of the North Central Tremellales. Stud. nat. Hist. Ia. Univ. **19,** no. 3.

Miller, L. W. (1934). The Hydnaceae of Iowa. II. The genus *Odontia*. Mycologia **26,** 13–32.

Petch, T. (1924). Revisions of Ceylon fungi. VII. Ann. R. bot. Gdn Peradeniya **9,** 119–184.

Wakefield, E. M. (1930). Australian resupinate Hydnaceae. Trans. roy. Soc. S. Aust. **54,** 155–158.

Wright, J. E. & Iaconis, C. L. Estudios sobre Basidiomycetes. III. *Polyporus rickii* f. sp. *negundinis* sobre arces vivos. Rev. Invest. agríc., B. Aires **9,** 97–110.

AN AFRICAN ODONTOSORIA.

F. Ballard

Odontosoria africana *F. Ballard*, sp. nov. Filix scandens ; frondium axes omnes laeves plus minusve rubidae espinosae, frondes tripinnatae usque quinquepinnatae, segmenta ultima anguste oblonga, usque 3 mm. longa, indusium ellipticum vel obovatum, segmento angustius, sporae triletae, globoso-tetrahedrae, 40μ–54μ diametro.

Rhizome short-creeping ; scales dark brown, rigid, 4–6 cells wide at base, narrowing abruptly upwards into a long jointed hair. Stipes reddish to straw-coloured, channelled on the face, 13·5 cm.–45.0 (or more) cm. long ; rhachis similar but more or less flexuous, bearing alternate patent pinnae. Lamina 48 cm.–71 (or more) cm. long, 18 cm.–38 cm. wide, lanceolate-ovate in outline, tripinnate-pinnatifid to quinquepinnate. Pinnae patent, lanceolate to ovate-lanceolate or triangular ; primary pinnules triangular to lanceolate ; secondary and tertiary pinnules variable in outline but ultimate pinnules forked or flabellately or pinnately deeply cut ; ultimate segments up to 3 mm. long, narrowly oblong, mostly 1-veined. Sorus about one half as broad as segment, elliptic to obovate ; indusial flap about as long as lamina ; edges of lamina and indusium entire. Sporangial annulus of 21–23 hardened cells ; spores trilete, globose-tetrahedral, 40μ–54μ in diameter.

Uganda. Kigezi District ; Mushungero, 2000 m. alt., occasional fern climbing to 5 ft. ; stems red, August 21.1938, *A. S. Thomas* 2409 (K, holotype) ; Lake Mutanda, above Mushongero, 1840 m. alt., on red mud bank, Jan. 31.1939, *Mrs. M. V. Loveridge* 444 ; Bukimbiri, 1840 m. alt., Oct. 1947, *J. W. Purseglove* 2492.

Belgian Congo. Lake Tanganyika, Kabimba, 1200 m. alt., gallery forest on Lubandaye, Nov. 10.1946, *Van Meel* 103 (B.M.).

The genus *Odontosoria* (Presl) Fée has hitherto been considered exclusively American, being distinguished from its close relative, *Sphenomeris* Max., by the indefinite rampant growth of the fronds and the frequent presence of spines on the rhachises. The spores also would seem to constitute a difference, being globose-tetrahedral in *Odontosoria* and monolete and bilateral in *Sphenomeris*.

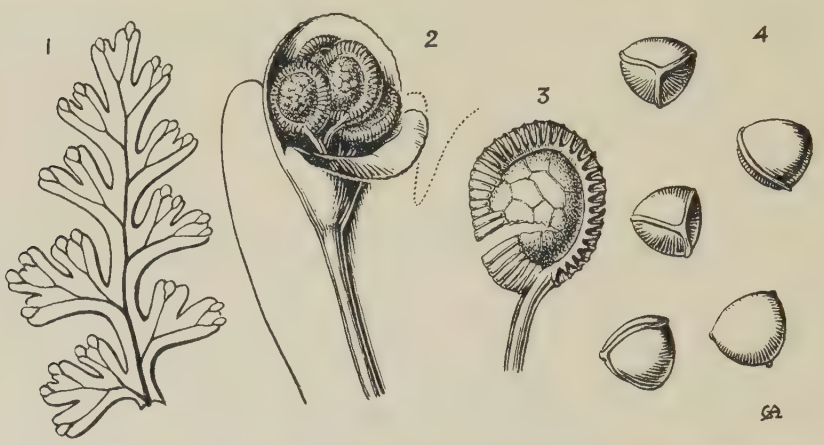

Fig. 1. Portion of frond of *Thomas* 2409, × 4·5. 2. Single sorus with indusium pulled away to expose sporangia, × 45. 3. Sporangium, × 90. 4. Spores × 600.

The present plant was at first thought to represent a new species of *Sphenomeris* but a more considered examination showed it to belong undoubtedly to *Odontosoria*. In the first place it is described as a climbing fern by collectors, the *Thomas* specimen in particular attaining five feet in height. It is difficult to see from young fronds whether the apical growth is continuous or otherwise.

The habit and cutting of the fronds reminds one forcibly of the Jamaican *O. fumarioides* (Sw.) J. Sm. and the Costa Rican *O. gymnogrammoides* Christ. The figure of *O. fumarioides* in Contrib. U.S. Nat. Herb. **17.** 166, pl. 4 (1913) bears an astonishing resemblance to *Thomas 2409* apart from the presence of spines. The number of thickened cells in the annulus ranges from 21–23 in *O. africana* whereas the figure for *Sphenomeris*, fide Copeland, is from 14–18. The greatest difference, however, lies in the spores ; those of *O. africana* agreeing perfectly with those of *O. aculeata* (L.) J. Sm. and *O. schlechtendalii* (Pr.) C. Chr. The spores of *Sphenomeris chinensis* Max., on the other hand, are monolete and bilateral and it would appear, according to Copeland, that in this genus the spores are rarely globose-tetrahedral.

A REVISION OF OXYGONUM.

(Polygonaceae–Polygoneae).

R. A. Graham

The genus *Oxygonum* [ὀξύς (sharp) γωνία (angle)], which with the exception of the Madagascan endemic *O. tristachyum*, and *O. atriplicifolium* which is recorded from Madagascar, is confined wholly to the African continent, was created by Burchell in the binomial for the generic type *O. alatum* [Trav. 1 : 548 (1822)]. This species is characterised by a broadly-winged non-prickly fruit, and Meisner later confined to the genus *Oxygonum* those species whose fruit lacked prickles (whether winged or not). For species with prickly fruit, he created *Ceratogonon* [κέρας (horn)] [Meisn. in Wall. Pl. As. Rar. 3 : 69 (1832) ; later *Ceratogonum*, in DC. Prodr. 14 : 39 (1856)], and the two genera were kept apart in DC. Prodromus on this character in particular. However, the fruit characters appear to be more suitably regarded as specific rather than generic, as many other characters are similar for both genera, and although the genus *Oxygonum* can be conveniently divided into a prickly and a non-prickly section, there seems little taxonomic value in a generic separation on such a basis. Bentham & Hooker f. synonymised *Ceratogonum* with *Oxygonum* [Gen. Pl. 3 : 96 (1853)], and there it has since remained.

O. sinuatum is apparently the most widespread species, probably extending throughout all parts of Africa—where there is suitable terrain —except the North-west, whence no records of any spp. are apparently available. The area covered by this species roughly corresponds to the total distribution of the genus in Africa. The prickly-fruited species, apart from *O. sinuatum*, cover the northern general area of distribution, while the non-prickly species are dominant in South Africa, gradually becoming less frequent northwards, and not so far recorded north of Ujiji on Lake Tanganyika. The region of overlap corresponds roughly to Rhodesia on the eastern side of Africa : on the western side the position is not clear.

In the south, the very variable *O. dregeanum* (agg.) is dominant. It was not found possible specifically to separate this taxon from certain others within the main area of its distribution, thus certain former species have been relegated to varietal grade. Such treatment was not possible, even if desirable, among northern species where interspecific similarities were apparent, as in some cases the material *per speciem* was too scanty, and a clear picture of intraspecific variation was not or at best only very inadequately obtainable.

Oxygona are polygamous and heterostylous. Polygamy is less obvious in *O. dregeanum* and some of its varieties, but is seemingly always present in some degree and increasing as this species or its varieties extend northwards. Polygamy is usually quite easily detected by examining the pedicels : those of ☿ flowers become thicker and sometimes longer as the fruit matures, while those of the unisexual ♂ flowers remain weak and wither. Heterostyly occurs throughout the genus, usually strongly differentiated but only slightly so in *O. sinuatum* and *O. quarrei* (so far as this latter species is assessable). In the field, the degree of heterostyly

can often be detected by examining a flower with a hand lens : in strongly heterostylous forms the long-styled flowers have exserted stigmas, thus the finding of such indicates the heterostylous nature of the plant whether or not short-styled flowers are seen. This ready distinction may be useful when distinguishing *O. sinuatum* from *O. stuhlmannii* (q.v.).

The annual or perennial status of many species is not known. *O. sinuatum* is almost certainly an annual weed, while others—such as *O. tenerum*—are clearly perennial though suffer annually from fire or grazing (? or both). Some species, e.g. *O. buchanani*, *O. tristachyum*, *O. auriculatum*, and *O. fruticosum* are evidently bushes ; but herbs would appear to comprise the bulk of the species.

Oxygona should always be collected with ripe fruit. Immature fruit may or may not be adequate, but examples wholly without fruit are often useless—except in certain cases where a decisive vegetative character may be adequate for determination. Yet although the fruit on the whole seem to provide the best medium for interspecific distinction, a warning must be given that in many cases—particularly among the prickly-fruited species—the limits of variation in certain fruit characters are not known. This applies especially to the number of prickles additional to the three main ones on the angles : certain species, e.g. *O. sinuatum*, may have six prickles in all, and the fact that this number has not been noted in a species such as *O. stuhlmannii* is not to say that it may not occur. Conversely, in the case of *O. schliebenii*, which so far as is known appears to have six prickles, the number may perhaps be reduced to three on occasions. It is probable that a genic instability causes variation in the number of prickles, presence or absence of a wing, etc.

Key to the species of Oxygonum.

1. Leaves with the lower part of the lamina adnate to the ocrea. Glaucous bush with ascending, ± appressed leaves. Fruit narrowly winged, transversely wrinkled, ? longitudinally striate . . . . . 1. *O. auriculatum*

1. Leaves with the lamina not adnate to the ocrea :

2. Leaves large, 5·25–10 × 3·5–5·5 cm., ovate-oblong, broadly ovate, or rounded elliptic ; the margin essentially entire—i.e. never lobed but sometimes very shallowly uneven :

3. Leaves basally rounded. Ocreae terminally setose. Bracts contiguous. Fruit with a succulent pericarp. (Madagascar only) . . . . . 2. *O. tristachyum*

3. Leaves basally—often long—attenuate. Ocreae terminally esetose. Bracts not contiguous. (Fruit uncertainly known). (If ocreae with long fringing setae ; raceme not more than 10 cm. long ; fruit trigonous, unarmed ; see No. 27 *O. ovalifolium*) . . . . . 3. *O. buchananii*

2. Leaves (except in the deeply lobed *O. lobatum*) not as large as Nos. 2 and 3 above, and usually much smaller, seldom attaining 6 cm. in length ; very variable in shape and degree of lobing :

4. Fruit with prickles or teeth, with or without wings :
   5. Fruit without wings :
      6. Fruit with 6–12 (–15) prickles (1 on each angle spreading ± centrally with 1–3 ± centrally on each intervening face. In addition with or without 1 small additional prickle on each angle in its lower half) :
         7. Fruiting pedicels exceeding the bracts by 15–25 mm. ; leaves lanceolate to elliptic, entire, sessile or shortly petiolate ; fruit with 6–12 (–15) prickles
            4. *O. schliebenii*
         7. Fruiting pedicels exceeding the bracts by 4–5 mm. ; fruit with 6 prickles ; plant glabrous or pubescent ; flowers slightly heterostylous . . 12. *O. sinuatum**
      6. Fruit with 3 prickles or teeth only (on the angles) :
         8. Prickles (not teeth) central or ± so ; if in the lower half then not or scarcely basal :
            9. Fruiting pedicels exceeding the bracts by 6–30 mm. :
               10. Fruiting pedicels exceeding the bracts by 6–13 mm. Leaves linear, somewhat clustered and fastigiate
                  7. *O. subfastigiatum*
               10. Fruiting pedicels exceeding the bracts by 15–25 (–30) mm. Leaves entire, ovate-deltoid, basally rounded or shortly attenuate-rounded
                  8. *O. leptopus*
            9. Fruiting pedicels not exceeding the bracts by more than 6 (–8) mm. :
               11. Fruiting pedicels 5–8 mm. long (?= exceeding the bracts by these lengths). Fruit 8 mm. long. Leaves deeply incised . . . . 9. *O. hirtum***
               11. Fruiting pedicels exceeding the bracts by not more than 5 (–6) mm. :
                  12. Leaves basally sagittate, closely tomentose. Inflorescence stalk stout. Fruiting pedicels only slightly exceeding the bracts. (If inflorescence stalk slender, and fruiting pedicels long exceeding the bracts, see No. 16. *O. atriplicifolium*)
                     10. *O. sagittatum*
                  12. Leaves not basally sagittate :
                     13. Leaves entire, terete, very narrowly linear, not more than 1 mm. wide . 29. *O. gramineum*
                     13. Leaves lobed or if entire then not terete nor as narrow as 1 mm. :

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* For " slight " and " strong " heterostyly see under No. 12 *O. sinuatum*, on page 160.
** It is not certain whether the distinctions given for this species are valid.

14. Leaves lobed, the lamina and lobes all linear, neither terete nor more than 3 mm. wide (usually less) ; fruit transversely wrinkled, with prickles up to 2 mm. long, spreading from a little above the base or seeming ± basal at maturity
23d. *O. dregeanum* var. *canescens*

14. Leaves lobed, sinuous, or entire ; not terete, seldom linear and usually more than 1 cm. broad at maturity ; fruit not transversely wrinkled :

15. Leaves deeply lobed :

16. Fruit 10 mm. long ; the prickles 1–1·5 mm. long and spreading from within the lower half (but not basal). Bracts terminally esetose. Flowers strongly heterostylous. Large, lush, glabrous herb, with leaves 6·5–9 × 2·5–4 cm. . . 11. *O. lobatum*

16. Fruit 5–7 mm. long ; the prickles 1·5–2 mm. long, spreading from the centre or slightly below. Bracts terminally setose :

17. Flowers slightly heterostylous. Fruit 5–7 mm. long. Weedy annual
12. *O. sinuatum*

17. Flowers strongly heterostylous. Fruit 5 mm. long. Raceme often very elongated . . 13. *O. stuhlmannii*

15. Leaves entire, or sinuous, or shallowly lobed :

18. Leaves elliptic, entire, ± equally narrowed to each end :

19. Fruit 9–10 mm. long. Short styles (1·5–) 2 mm. long. Leaves variably hirsute (typically coarsely pilose). Flowers strongly heterostylous ; if slightly so see No. 12 *O. sinuatum*
14. *O. magdalenae*

19. Fruit 5 mm. long. Short styles 1 mm. long. Leaves glabrous to pubescent . . . . 13. *O. stuhlmannii*

18. Leaves deltoid, hastate, lanceolate, narrow-lanceolate, linear, oblanceolate, ovate or obovate in outline ; the margin often uneven if only very shallowly so, sometimes entire :

20. Flowers slightly heterostylous :

21. Leaves usually lobed. Prickles arising from the centre of the angles, or slightly below, 1·5–1·75 (–2) mm. long
12. *O. sinuatum*

21. Leaves ± entire. Prickles arising from shortly above the base of the fruit, 2–3 mm. long
15. *O. quarrei*

20. Flowers strongly heterostylous :

21. Fruiting pedicels filiform, reflexed or ± so, exceeding the bracts by 4–6 mm. Leaves ovate to deltoid, more rarely lanceolate, not normally more than 5 cm. long, basally truncate or ± hastate or shortly cuneate. Fruit glabrous to densely pubescent, 5–6·5 (–7) mm. long . 16. *O. atriplicifolium*

21. Fruiting pedicels erect or spreading, scarcely filiform, not exceeding the bracts by more than 3 mm. :

22. Fruit 10 mm. long. Leaves linear to linear-lanceolate. Inflorescence slender. Ocreae with terminal, long, reddish bristles. Creeping herb
17. *O. salicifolium*

22. Fruit 5–7 mm. long. Inflorescence stout :

23. Leaves pilose, with a central reddish blotch. Fruit 6–7 mm. long . 18. *O. maculatum*

23. Leaves glabrous to pubescent, unblotched. Fruit 5 mm. long . 13. *O. stuhlmannii*

8. Fruit with rudimentary, or developed but usually short prickles or teeth spreading or reflexing from the angles at or near the base of the fruit ; transversely wrinkled or not :

24. Fruit transversely wrinkled when mature, 7–9 mm. long. Leaves linear, with linear lobes, sometimes twice pinnately lobed
22d. *O. dregeanum* var. *canescens*

24. Fruit not wrinkled :

25. Fruit up to 5 mm. long. Leaves linear to lanceolate or lanceolate-elliptic with or without linear or narrow-lanceolate lobes, sometimes a little arcuate. Basal teeth sometimes very rudimentary. Cup-like scales absent. . . . 19. *O. delagonense*

25. Fruit c. 7 mm. long. Leaves lanceolate, entire or more often deeply pinnately lobed. Ocreae, stems and petioles often covered with cup-like scales . . . . . 20. *O. alatum*

5. Fruit with wings on the angles, sometimes with small prickles on the faces, with or without prickles on the angles :

26. Fruit without prickles on the angles :

27. Fruit with wings up to 6 mm. broad, unwrinkled (or very rarely wrinkled). Leaves ovate to lanceolate in outline, but often deeply and pinnately incised. Ocreae, petioles, stems and leaves often covered with white, cup-like scales . . . . . 20. *O. alatum*

27. Fruit narrowly winged, transversely wrinkled. Leaves entire, lanceolate to narrowly oblanceolate ; cup-like scales absent . . . 22e. *O. dregeanum* var. *wittei*

26. Fruit with prickles on the angles :

28. Prickles not or scarcely protruding beyond the limits of the wings. Leaves ovate to lanceolate in outline, but often deeply and pinnately incised. Ocreae, petioles, stems and leaves often covered with white cup-like scales . . . . . 20. *O. alatum*

28. Prickles sharp, protruding beyond the limits of the wings. Cup-like scales absent :

29. Leaves lobed, in outline broadly elliptic to ovate-elliptic. Flowers slightly heterostylous ; fruit 8–10 mm. long; wings usually narrow, but irregular in width. Plant glabrous throughout . 5. *O. litorale*

29. Leaves unlobed, long-petiolate, elliptic. Flowers strongly heterostylous ; fruit 7–8 mm. long ; wings usually narrow, but irregular in width. Stems ocreae and petioles pubescent . . 6. *O. ellipticum*

4. Fruit without prickles, teeth, or wings :

30. Fruit transversely wrinkled when mature :

31. Ocreae with a spreading, foliaceous limb. Fruit 7–8 mm. long, pubescent :

32. Leaves ovate-lanceolate to ovate, 3–4 × 1·4–2·4 cm. 21. *O. limbatum*

32. Leaves linear to oblanceolate, not exceeding 1 cm. in width . . . . . 22a. 22d. *O. dregeanum*

31. Ocreae without a spreading, foliaceous limb :

33. Shrub with woody branches. Leaves ± narrow, lanceolate-elliptic. Perianth tube c. 6 mm. long. Flowers showy, wine red outside, white within. Fruit 8–10 mm. long, erect when mature . 23. *O. fruticosum*

33. Herbs, not woody except sometimes at the base. Perianth tube 2–3 mm. long (or less). Fruit 8–9 mm. long, erect or pendulous when mature :

34. Tepals c. 6 mm. long. Inflorescence usually short, congested :

35. Leaves narrowly oblanceolate to linear, or broadening to oblanceolate, not or only weakly lobed
22a. *O. dregeanum* var. *dregeanum*

35. Leaves with a narrow-linear lamina and with long, narrow linear lobes
22b. *O. dregeanum* var. *swazicum*

34. Tepals 3–4 mm. long. Inflorescence often extended and far exceeding the leafy parts of the plant. Leaves linear to narrowly elliptic-lanceolate, unlobed or faintly sinuous. Fruit 5–9 mm. long
22c. *O. dregeanum* var. *strictum*

30. Fruit without transverse wrinkles when mature, trigonous or not, ovoid-ampulliform in outline.

36. Fruit trigonous :

37. Leaves linear, very narrow, up to 0·75 mm. broad. Fruit with many obscure longitudinal striae
24. *O. tenerum*

37. Leaves lanceolate, elliptic-lanceolate, oblanceolate, or ovate, more than 5 mm. broad :

38. Leaves not more than 1·2 cm. broad, elliptic or elliptic-lanceolate ; largely glabrous
28. *O. vanderystii*

38. Leaves when mature 3–4 cm. broad, ovate. Raceme stalks, pedicels, ocreae, petioles hairy
27. *O. ovalifolium*

36. Fruit not trigonous :

39. Leaves linear, glabrous, 2·25 (–9) mm. broad. Ocreae with fringing bristles less than 3 mm. long
26. *O. lineare*

39. Leaves elliptic-lanceolate to lanceolate, covered with white indumentum. Ocreae with fringing bristles c 7 mm. long . . . . . 25. *O. pachybasis*

1. **O. auriculatum** *R. Grah.*, sp. nov.

Frutex glaucus ab omnibus speciebus differt foliis basi auriculatis et laminis ad ocreas longe adnatis. Typus : Angola, Lunda, Luma-Cassai, 1250 m., Apr. 1937, *Exell & Mendonça* 1211 (BM, holo. !). Fig. **2** (8).

Frutex passim glaber. *Caulis* sulcatus teres supra viridi-fuscus infra fuscus, praecipue ab ocreis foliisque occultus. *Ocreae* ut videtur 3–3·5 cm. longae, glaucae, apice setis appressis ± crassis 4–5 mm. longis instructae. *Folia* glauca sessilia oblanceolata, c. 6·5 × 1·4 cm., apicè breviter attenuata valde acuta mucronata, basi auriculis parvis instructa, laminis ad ocreas per 1–2 cm. adnatis. *Inflorescentia* elongata, ± valida, efoliosa, 26 cm. longa (unam tantum vidi). *Bracteae* 2–4 mm. longae, oblique truncatae, postice productae, esetosae. *Pedicelli* 2 mm. longi, 2-jugati, erecti. *Flores* ? leviter heterostylosi (immaturos tantum vidi) ; tepalis ovatis 2·5 mm. longis ; staminibus 8, 1·5 mm. longis, bases versus valde dilatis rubris ; antheris rubris, 0·5 mm. longis ; stylis 3, c. 1 mm. longis per c. 0·75 mm. connatis. *Fructus* maturus adhuc ignotus (unum immaturum tantum vidi) ; ut videtur 7 mm. longus, glaber, leviter striatus et transverse rugosus, ad angulos anguste alatus.

So far known only from the single example described above. This species differs, and is easily told from all others in that the lower part of the lamina of each leaf (approximately the lower third) is adnate to the ocrea. The glaucous erect, ± appressed leaves which tend to hide the stalk, and their small basal auricles provide another feature unusual for the genus. The shape of the mature fruit can only be guessed as ovoid-ampulliform.

2. **O. tristachyum** (*Bak.*) *H. Perr.*, Biogéogr. Pl. Madagascar : 59 (1936). Type : Madagascar, " chiefly in Betsileo-land ", *Baron* 137 (K, holo.!).

Syn. *Polygonum tristachyum* Bak. in J.B. 20 : 244 (1882).

This species, apparently a tall bush endemic to Madagascar, is the only one at present known to have a definitely succulent fruit. There is a superficial resemblance to *O. buchananii* in the broad, essentially entire leaves—which in both species are large for the genus—but the characters of the ocreae, leaf bases, and bracts, as given in the key, serve to distinguish them, apart from the apparent absence of *O. buchananii* in Madagascar, and of *O. tristachyum* in Africa.

3. **O. buchananii** (*Dammer*) *Gillett* in K.B. 1953 : 83 (1953). Type : Nyasaland, *Buchanan* 550 (K, lecto. !).

Syn. *Polygonum buchanani* Dammer in Engl., Pflw. Öst.-Afr. C : 170 (1895).

The only available fruit is very immature, but appears to have three protuberances which are interpretable as rudimentary prickles or teeth on the angles, perhaps central when mature. This species probably has the largest known leaves within the genus. Apart from Nyasaland where there are two records, of which one is from Namasi, and the other (type) unlocalised, it has been found only– and apparently once only—in

Tanganyika [Rungwe District, Kasambala, C. 3½ miles S. of Kyimbila Mission, *Stolz* 1090 (K !)].

4. **O. schliebenii** *Mildbr.* in Notizbl. Bot. Gart. Berlin 14 : 103 (1938). Type : Tanganyika, Lindi District, Lukuledi Valley, *Schlieben* 6475 (B, holo. ! ; BM, iso. !).

The very long fruiting pedicels serve to distinguish this species from all other except *O. subfastigiatum* and *O. leptopus* from both of which it is told by leaf characters. *O. schliebenii* is offered here as a species of considerable variability in leaf-shape. Mildbraed describes this as lanceolate, but in all type material seen it is much nearer elliptic, albeit narrowly so. Under this name I include two gatherings [*Kirk* s.n. (K !) ; *Ward* U7 (K !)] which, while agreeing in shape and size of fruit and in the long fruiting pedicels, differ from type material in having lobed or sinuous leaves of a more lanceolate or ovate-elliptic outline. It is, however, possible that more than one taxon may be involved, which only further collecting can definitely decide. A gathering from Tanganyika, Kilwa district, 35 m. S. of Kilwa Kivinji (*Milne-Redhead & Taylor* 7558 !), has 3 small spines on each face, in between the angle spines, thus 12 spines in all: the slender racemes are up to 2 feet long.

This species is apparently confined to Tanganyika, being recorded only from the maritime Lindi and Kilwa Districts ; and, inland, from Iringa District.

5. **O. litorale** *R. Grah.* sp. nov.

Species *O. stuhlmannii* nonnihil affinis, caulibus crassioribus ocreis longioribus fructibus majoribus 6-aculeatis differt. Typus : N. Rhodesia, Chiengi, Lake Mweru, *Bullock* 1236 (K, holo. !). Fig. **2** (1, 2).

Herba perennis semi-procumbens omnino glabra. *Caulis* validus ramosus rubro-fuscus 3–4 mm. crassus, internodiis 3·5–5 cm. longis. *Ocreae* caule rubriores, lucentes, 7–10 mm. longae, haud appressae, truncatae, setis patentibus 5–8 mm. longis eodem colore fimbriatae. *Folia* ambitu elliptico-lanceolata, 2·5–5 × 0·4–1·5 cm., valde lobata, longe decurrentia itaque ut sessilia videntur, apice acuta mucronata, apud ramos juvenales aliquanto fasciculata. *Inflorescentia* valida caule triquetro ad 2 mm. crasso, elongata, stricta vel tenuiter arcuata. *Bracteae* 3–6 mm. longae, setis basi subulatis fimbriatae, internodiis 1·5–3 cm. longis. *Pedicelli* erecti, 3–4-jugati, bracteis c. 2 mm. longiores. *Flores* 4·5 mm. longi, leviter heterostylosi ; tepalis punctatis, 2·5 mm. longis, anguste ovato-lanceolatis ; filamentis flavis basi rubrioribus, 2 mm. longis ; stylis (longis) 2·25 mm. longis, per 1 mm. connatis, (brevibus) 1·5 mm. longis, per 0·5–0·75 mm. connatis. *Fructus* fusiformes, 8–10 mm. longi ; aculeis 3 patentibus vel retrorsis vel leviter ascendentibus ad 4 mm. longis ex medio angulorum aucti, nonnumquam aculeis 3 minoribus adjectis infra eos et aculeis 3 brevissimis in medio facierum ; nonnunquam angulis anguste alatis.

This species has certain affinities with *O. stuhlmannii*, but it is a tougher herb, glabrous throughout, with larger fruit bearing 6 (–9) protruding prickles. Whether it be a form of *O. stuhlmannii* induced by genetic irregularities can only be decided by a cytogenetical investigation, as the

FIG. 1. 1, *Oxygonum maculatum*, × $\frac{2}{3}$, showing spotted leaves ; 2, *O. lobatum*, × $\frac{2}{3}$; 3, apex of inflorescence, × $\frac{2}{3}$, and 4, fruit of same, × 2 ; 5, *O. subfastigiatum*, × $\frac{2}{3}$; 6, *O. ellipticum* (with inflorescence diagrammatically deflexed), × $\frac{2}{3}$; 7, fruit of same, × 2 ; 8, *O. sagittatum*, × $\frac{2}{3}$.

FIG. 2. 1, *Oxygonum litorale*, × $\frac{2}{3}$; 2, fruit of same, × 2; 3, *O. gramineum*, × $\frac{2}{3}$; 4, fruit of same, × 2; 5, *O. limbatum*, × $\frac{2}{3}$; 6, fruit of same, × 2; 7, limbate ocrea of same, × 2; 8, *O. auriculatum* (with immature fruits), × $\frac{2}{3}$.

varying number of prickles and presence or absence of a wing suggest some instability. So far it is known only from the type locality where it is " co-dominant of the Lake Mweru littoral, forming long thin lines along a dune contour ".

6. **O. ellipticum** *R. Grah.* sp. nov.

Species *O. schliebenii* ut videtur affinis, sed differt foliis longe petiolatis, internodiis longioribus, pedicellis brevibus. Typus : Tanganyika, Mpanda District, Lake Katavi, 1950, *Bullock* 2333 (K, holo.!). Fig. **1** (6, 7).

Herba semi-prostrata, forsan perennis. *Caulis* valde elongatus paucifoliosus sulcatus brunneo-viridis ramosus, setulis dispersis leviter pubescens ; internodiis 6 -9 cm. longis. *Ocreae* 0·8–1·1 cm. longae, truncatae, juvenales ± appressae dein apertiores, pubescentes glandulosaeque, apice membranaceae setis 4–4·25 mm. longis pubescentibus instructae. *Folia* longe petiolata margine ± integro, elliptica vel elliptico-lanceolata, 3·5–5·5 × 0·6–1·9 cm., undique ± regulariter decurrentia, apice acute mucronata ; ± glabra sed margine puberula et nervis subtus breviter pilosis ; petiolis ad 1·5 cm. longis. *Inflorescentia* efoliosa, valde elongata, plusminusve tenuis non filiformis, ad 30 cm. (vel ultra ?) longa. *Bracteae* glabrae, 4–5 mm. longae, 0·5–4 cm. distantes, seta dorsale 3–4 mm. longa et 1–2 setis lateralibus minoribus instructae. *Pedicelli* ad 2–4 mm. bracteas excedentes, 2–3-jugati, glabri vel minute puberuli. *Flores* heterostylosi, albi (stylos longos tantum vidi) ; tubo 1 mm. longo ; tepalis 2·5 mm. longis, cucullatis, late linearibus ; stylis 3, 3·5 mm. longis, per 1 mm. connatis ; filamentis exterioribus c. 1 mm. longis, ad tepala adnatis, interioribus 1·5–1·75 mm. longis. *Fructus* papillosus vel glaber, late fusiformis, 0·7–0·8 mm. longus, aculeis 3 patentibus c. 2–2·5 mm. longis ex angulis, et aculeis 3 minoribus inter eos apud facies vel o munitus ; anguli anguste sed variabiliter alati, infra aculeos 1-2 dentibus parvis (= aculeis rudimentariis) muniti.

As in *O. litorale*, the fruit show some variation in the width of wings, and in the size of the facial, and size and number of the secondary angle prickles. The long internodes, long petioles, and elliptic leaves give an unusual appearance. It is apparently not a very leafy herb. There is considerable resemblance to the more elliptic-leaved forms of *O. stuhlmannii*, but the fruit of the latter is smaller, with three spines only.

Known only from type locality where it occurs on the sandy shore of the lake.

7. **O. subfastigiatum** *R. Grah.* sp. nov.

Ab aliis speciebus ocreis efoliosis persistentibus in inferioribus caulium partibus, foliis linearibus aggregatis subfastigiatis, pedicellis elongatis distinguitur. Typus : Tanganyika, Orero, near Kilwa Kivinji *Braun* 1305, (K, holo. !, EA, iso.!). Fig. **1** (5).

Herba perennis. *Caulis* lignosus 12 cm. vel ultra longus rubro-fuscus ± glaber, in partibus inferioribus ab ocreis nunc efoliosis ± occultus. *Ocreae* truncatae, supra congestae 2·5–7 mm. longae, membranaceae, ut caulis coloratae, setis flexuosis ad 8 mm. longis apice instructae. *Folia* ± dense aggregata, erecta, subfastigiata, linearia, 2·5-3·5 × 0·2-0·25

cm., ? subcoriacea, apice mucrone aristato munita, subsessilia, utrinque glabra, marginibus plerumque revolutis. *Inflorescentia* tenuis ad 15 cm. longa, ut videtur nonnumquam arcuata. *Bracteae* 3–4 mm. longae, setis c. 2 mm. longis apice instructae. *Pedicelli* filiformes 2–4-jugati, illi ☿-florum 6–13 mm. longi, rubri glabri cum fructibus ± pendentes ; illi ♂-florum ad 3 mm. tantum longi, mox marcidi nec elongescentes. *Flores* brevistylosos marcidos tantum vidi ; tubo 1·25 mm. longo ; tepalis lineari-lanceolatis apice cucullatis 2 mm. longis ; stylis 2 mm. longis per c. 1·25 mm. connatis ; filamentis c. 3 mm. longis, (antheris non visis). *Fructus* valde immaturus, pubescens, aculeis 3 patentibus ex medio (ut videtur) angulorum armatus.

The linear, rather short leaves are congestedly restricted to the bases of the racemes, below which the stem is woody and largely obscured by persistent ocreae—indicating either the location of leaves of previous seasons' growth, or a marked deciduousness during growth in a current season. The former alternative is perhaps the most likely. The only habitat information is " sandy soil ", and if in fact the plant grows in loose sand the leafless basal stems might be expected, by analogy with certain other dune plants. Except in the rather long fruiting pedicels, this species shows nearest affinity to *O. salicifolium.* Whether it be a form of this induced by conditions of habitat can only be decided by further collecting and observation under cultivation.

This species also shows some affinity to Kirk *s.n.* (K !), already referred to under *O. schliebenii*, and it is noteworthy that both Kirk and Braun's plants are recorded from Kilwa. The former specimen has pubescent stems and ocreae, narrow-lanceolate, sinuous, pubescent leaves, and 6-prickled fruit, and shows none of the traces of previous foliation that characterises *O. subfastigiatum*, which is glabrous, whose leaves are linear, ± fastigiate, and whose fruit, insofar as can be seen, bear only 3 prickles. It is possible that Kirk and Braun's plants are different habitat forms of one species, in which event *O. subfastigiatum* would—according to this reasoning—become an extreme form of *O. schliebenii.* It seems best, however, to leave Braun's plant as a species until such time as further field work may prompt an alteration in grade or status.

8. **O. leptopus** *Mildbr.* in Notizbl. Bot. Gart. Berlin 11 : 810 (1933). Type : Tanganyika, Ulanga District, *Schlieben* 2324 (B, holo. ! ; BM, iso. ! ; HBG, iso. !).

A perennial, with a thick stock and annual, straggling shoots, which is told from all other African species by the small, ovate-deltoid, clearly petiolate leaves which do not exceed 3·5 × 2 cm. and are basally rounded or near-rounded to a petiole which due to lack of decurrence of the lamina stands out unusually clearly by comparison with most other species. The fruiting pedicels are probably the longest in the genus. The number of flowers—largely ♂—to each bract, 5–9, is also unusual. No fruit, and only one inadequate short-styled flower were seen, the latter having styles 1 mm. long connate for 0·4 mm. Mildbraed says of the fruit :—" fusiform-trigonous, villous, with 3 small erect prickles ".

Unknown apart from the type record—" East Mahenge-district between Mahenge-Plateau and the confluence of the Kilombero (Ulanga)

and Luwegu to the Rufiji, c. 400 m. alt. Schauri, dry wood, sandy, abundant among low grass, creeping ".

9. **O. hirtum** *Peter* in Fedde Rep. Beih. 40, 2 (Anh.) : 18, tab. 22, 1 (1938). Type : Tanganyika, Pare District, Same, *Peter* 11883 (formerly B, holo.).

No authentic material of this species has been seen : the type having been destroyed. From the illustration it is tempting to regard Peter's species as a form of either *O. sinuatum* or *O. atriplicifolium* with fruiting pedicels rather longer than is usual and with densely hairy fruit (but which are *minute hirtello* in Peter's description). Geographically, either of these two suggested species could be involved. Unfortunately Peter gives no hint as to the degree of heterostyly. Of the two, the illustration favours affinity with *O. sinuatum* through the deeply incised leaves and apparently robust rather than slender habit. It is unlikely perhaps that Peter's plant is separable specifically from this latter species, but further collecting in the type neighbourhood is clearly desirable.

10. **O. sagittatum** *R. Graham* sp. nov.

Ab omnibus hujus generis speciebus (praeter *O. atriplicifolium* raro) differt foliis tomentosis angustis basi sagittatis. Typus : Kenya, Northern Province, Dandu, *Gillett* 12694 (K, holo. !). Fig. **1** (8).

Herba ? perennis, ramosa. *Caulis* decumbens viridi-fuscus, 30 cm. et ultra altus, teres sulcatus dense albo-pubescens ab ocreis plerumque occultus ; internodiis ad 1·7 cm. longis. *Ocreae* membranaceae dense pubescentes, 0·7–1·2 cm. longae, truncatae, setis rubris pubescentibus 7–10 mm. longis apice instructae. *Folia* anguste lanceolata integra vel uno lobo ± sagittato in medio instructa, 2·7 × 0·6 cm., apice acute mucronata, basi lobis sagittatis aucta et hinc in petiolum breviter vel non decurrentia, utrinque dense tomentoso-pubescentia, marginibus revolutis, costa subtus eminente ; lobis basalibus ad 6 mm. longis ; petiolis 0·6–1·2 mm. longis angustissime alatis. *Inflorescentia* elongata ± robusta saepe leviter arcuata, 6–18 cm. longa, axillaris efoliosa interrupta ; internodiis 0–1·6 cm. longis. *Bracteae* 2–4 mm. longae, ut ocreae sed minus membranaceae, et seta dorsale 4 mm. longa et setis lateralibus brevioribus instructae. *Pedicelli* 1–3 jugati, bracteas paululo excedentes. *Flores* albo punicei, heterostylosi (stylos longos tantum vidi) c. 5 mm. longi ; tepalis 5 cucullatis punctatis obovatis ; stylis 3, 4 mm. longis per 1·5 mm. connatis ; stigmatibus capitatis flavis ; staminibus 8, 5 exterioribus ad tepala adnatis, 3 interioribus basi dilatatis pubescentibus circum stylum dispositis, omnibus c. 1 mm. longis ; antheris 0·75 mm. longis. *Fructus* (immaturus tantum) 6 mm. longus fusiformis dense pubescens, aculeis 3 patentibus 1 mm. longis ex medio munitus.

This species, unknown apart from the type record (Northern Province : Dandu, alt. 1100 m.), is readily told from all other species of *Oxygonum* except certain forms of *O. atriplicifolium* q.v., by the sagittate basal lobes of the narrow leaves, which sometimes have one additional ± sagittate lobe on each side at the centre or below. The flowers are probably strongly heterostylous. It is also a remarkably hairy species for this genus, the close tomentum imparting a greyish tint to the leaves.

11. **O. lobatum** *R. Graham* sp. nov.

Species *O. buchananii* forsan affinis, sed foliis profunde lobatis valde distincta. Typus : Tanganyika, Morogoro District, Morogoro-Dakawa road, *Drummond & Hemsley* 1775 (K, holo. !). Fig. **1** (2, 3, 4).

Herba probabiliter perennis, robusta ramosa subdiffusa plerumque glabra. *Caulis* erectus (?), fuscus, 50 cm. altus vel ultra, teres sulcatus basi sublignosus, glaber vel papillis paucissimis instructus ; internodiis 6·5–9·5 cm. longis. *Ocreae* infundibuliformes, superne foliosae, fusco-papyraceae, 4–5 mm. longae, glabrae, apice truncatae sed postice in apicem lanceolatum acutum productae, saepe laceratae, setis 4–5 mm. longis vel brevioribus vel 0 fimbriatae. *Folia* apud nodos aggregata, pro genere magna, 6·5-9 × 2·5–4 cm., petiolata, ambitu ovata vel obovata sed irregulariter atque plusminusve profunde lobata, apice subacuta mucrone breve terminali membranaceo aucta, basi attenuata et in petiolum saepe inaequaliter decurrentia, utrinque glabra ; petiolis 1–2 cm. longis cum costa fuscis. *Inflorescentia* valida efoliosa, 35–40 cm. longa, interrupta, plerumque e bractea infima in ramos erectos bifurcata ; internodiis 0·5–5 cm. longis. *Bracteae* 4–6 mm. longae, ocreiformes sed minus papyraceae atque laceratae, apice esetosae vel 1–2 setis plusminusve brevibus instructae. *Pedicelli* bracteas 1–2 mm. excedentes, 1–3-jugati ; illi ♂-florum fusci nec producti nec accrescentes, illi ♀-florum virides, producti accrescentesque. *Flores* heterostylosi ; tepalis 5, oblongis, punctatis, 4 mm. longis, apice acutis cucullatis, extra viridibus intus cremeis ; (brevistylosi) filamentis 4 mm. longis, canis, filiformibus ; antheris linearibus, 0·75–1 mm. longis ; stylis (1·5–) 2 mm. longis per 1 mm. connatis ; stigmatibus capitatis ; (longistylosi) filamentis 2 mm. longis ; stylis 4 mm. longis per 2 mm. connatis. *Fructus* 10–11 × 6–8 mm. trigonus ovato-fusiformis, paulo infra medium aculeis 3 leviter retrorsis 1–1·5 mm. longis ex angulis munitus.

This species is known only from the Morogoro District of Tanganyika, from " scattered thornbush with poorly developed field and ground cover " (*Drummond & Hemsley*), and as a " weed of native cultivation " [*E. M. Bruce* 375 (K !)]. In both cases—there are no other known records—the altitude is 600 metres. In its coarsely lobed leaves it bears a superficial resemblance to the annual, weedy *O. sinuatum*, but it is a larger, lusher plant, probably perennial, without pustules on the leaf subsurfaces, without long setae fringing the bracts, and with a larger fruit whose prickles, at maturity, are shorter and distinctly spreading from the lower half. The greater affinity is to *O. buchanani*, whose mature fruit is unknown, which has a corresponding size of leaf (in outline) but whose leaves are essentially entire, and which has rather more slender racemes.

12. **O. sinuatum** (*Hochst. & Steud. ex Meisn.*) *Dammer* in Engl., Pflw. Öst.-Afr. C : 170 (1895). Type : Abyssinia, Chachito, *Schimper* 264 (K, iso. !).

Syn. *Ceratogonum sinuatum* Hochst. & Steud. ex Meisn. in DC. Prodr. 14 : 40 (1856). Type as for species.

Ceratogonum cordofanum Meisn. in DC. Prodr. 14 : 39 (1856). Type : Nubia, *Kotschy* 117 (K, iso. !).

Oxygonum elongatum Dammer in Engl., l.c. 170, *quoad spec. cit. Stuhlmann* 288 (B, ? lecto. !).

O. somalense Chiov. var. *pterocarpum* Chiov., Fl. Somal. II, 380 (1932) in part (ref. syn. *Gorini* 72 !).

This is the most widespread species of the genus, its range extending apparently throughout Africa except in the territories north of the Belgian Congo whence it does not seem to have been recorded. The degree of heterostyly is probably slighter than in any other species : the stigmata of long-styled flowers being only slightly or not held beyond the tips of the anthers, and those of short-styled flowers correspondingly only just or not below their bases (in strongly heterostylous species of this genus, the stigmata of long-styled flowers are exserted or ± so, while those of short-styled flowers do not usually reach the base of the anthers).

The position regarding *O. elongatum*, all of whose cited specimens are from Tanganyika, is not clear. According to the description, it is a plant with a more pronounced heterostyly than *O. sinuatum*, yet one of the cited specimens (q.v. above) is evidently this latter species. If Stuhlmann's example is disregarded, it is tempting to affiliate *O. elongatum* with *O. stuhlmannii*. This latter can be very like *O. sinuatum* but there is at least the possibility of *O. elongatum* being founded on more than one species.

An unusually lush example has been gathered in N. Rhodesia at Ndola (*Fanshawe* 698 !), with dark green, unevenly-edged but unlobed, rather large leaves (up to 7 × 3 cm.). The flowers are slightly heterostylous, and despite a somewhat unusual appearance it appears that this example must be included under *O. sinuatum* : it is perhaps a form induced by plentiful moisture.

Usually the prickles on the fruit number three, spreading from the angles. More rarely three subsidiary, small prickles will be found on the faces.

Two gatherings which appear to be this species, *Chandler* 1932 (BM !) from Uganda, and *Barker* 421 (EA !) from Nyasaland differ from the bulk of the material in having longer, more spreading pedicels (up to 4 mm.) ; and in their leaves which are narrower for their length (up to 9 cm.) and entire or rather shallowly lobed. Both these appear to recede through their leaf-shape from *O. sinuatum*, to which it nevertheless seems that they must be referred through fruit characters and degree of heterostyly. A third, even more unusual looking example is *Robyns* 2011 (K !), from Pweto in the Belgian Congo. In this case the leaves are elliptic in outline, up to 9 × 1·3 cm., very long-decurrent at the base, and extremely like those of the more strongly heterostylous *O. ellipticum*. They are however faintly sinuous on the margins—not a character of the latter species so far as is certainly known. The fruit is long for *O. sinuatum*, c. 8 mm., and there is slight alation in the lower half. It is evidently a straggling, weak herb with elongated racemes and no doubt reflects conditions of growth, which unfortunately are not recorded. Both this and the two aforementioned examples have slightly heterostylous flowers.

O. somalense var. *pterocarpum* is made up, according to its syntypes, of *O. sinuatum* and *O. atriplicifolium*. In neither case do the fruit show proper wing development, there being merely a membranous ridge to the angles.

13. **O. stuhlmannii** *Dammer* in Engl., Pflw. Öst.-Afr. C : 171 (1895). Type : Tanganyika, Muansa, *Stuhlmann* 4628 (B, holo. ! ; BM, iso. !).

Syn. *O. fasciculatum* Wright in F.T.A. 6, 1 : 102 (March. 1909) ; and in K.B. 1909 : 186 (May, 1909). Type : Kenya, Gilgil river, *Scott-Elliot* 6651 (K, lecto. ! ; BM, isolecto. !).

O. humbertii Robyns in Bull. Jard. Bot. Brux. 17 : 160 (1944). Type : Belgian Congo, Uvira, *Humbert* 7284 (BR, holo. !).

? *O. baumii* Dammer ex Wright, l.c. 103. Type : Angola, Kuito River, near Onjimba, *Baum* 532 (K, iso. ! ; BM, iso. !).

The leaf-shape of this species varies from elliptic-lanceolate to ± deltoid, from entire to shallowly lobed. The racemes are usually very elongated, exceeding the leafy, lower parts of the herb by up to c. 35 cm. or more. The pronounced heterostyly provides distinction from the often-simulating *O. sinuatum* (the leaves of the latter being, however, usually more deeply lobed).

Both *O. fasciculatum* and *O. humbertii* appear to belong to this species, the latter being a hirsute form, with rather longer short-styles (2 mm., connate for 1 mm. *fide* Robyns ; in typical *O. stuhlmannii* they are 1 mm. long and free almost to the base). It is, however, apparent that *O. stuhlmannii* is variable in most characters, and although such longer short-styles in *O. humbertii* might suggest a closer kinship to *O. sinuatum*, I believe, on the balance of characters that Robyns' species is more correctly referable to *O. stuhlmannii*, from which it can scarcely stand specifically apart.

O. baumii is too immature for any exact determination. There is similarity to the little less uncertain *O. somalense* in the leaf-shape, but the racemes of the latter are more tenuous. Judging from the poor evidence available, synonymy with *O. stuhlmannii* would appear to be its most reasonable status.

Gossweiler 1026 (K ! ; BM !) is perhaps referable to this species, but the material is scarcely adequate, there being no flowers for examination. It was gathered in Angola, at Malenge.

O. stuhlmannii, if accepted in the sense here offered, is recorded from Tropical East Africa, ? Angola, and the Belgian Congo.

14. **O. magdalenae** *Dammer ex Peter* in Fedde, Rep. Beih. 40, 2 : 186 (1932). Type : Tanganyika, Iringa District, plateau, *Magdalena Prince s.n.* (B, holo. !).

This species has shortly petiolate, elliptic leaves varying from ± coarsely hairy (as in type), through pilose largely on the nerves and margins, to glabrous. There is some resemblance both to *O. ellipticum* and to the more elliptic-leaved forms of *O. stuhlmannii* (to which it is probably nearly allied), from the first of which it is told by its stouter raceme stalks (0·75–2 mm. thick as opposed to 0·5–1 mm. in *O. ellipticum*), and by its 3-prickled fruits ; while from the second it differs in its larger fruit (9–10 mm. as opposed to 5 mm.) and in its longer short-styles (2 mm. as opposed to 1 mm.) whose stigmata are interspersed among the anthers.

15. **O. quarrei** *De Wild.*, Contrib. Fl. Katanga, Suppl. 1 : 11 (1927). Type : Belgian Congo, Katanga, *Quarré* 401 (BR, holo. !).

This species is, so far as is known, confined to the type material. De Wildeman is more accurate in describing the position of the fruit prickles in his French text than in the Latin—the prickles are clearly in the lower half (but not basal). This character on its own serves to distinguish this species from all others except *O. lobatum* whose spines are shorter relative to the size of the fruit. *O. quarrei* is a rather stout, lush herb, with stout, erect raceme stalks up to 2·5 mm. thick. Like *O. sinuatum* the leaves are very pustular. The fruiting pedicels are short, up to c. 2 mm. long, and appear to spread horizontally; but fully mature fruit has not been seen, thus it is possible that the pedicels may later reflex.

16. **O. atriplicifolium** (*Meisn.*) *Martel.*, Fl. Bogos., 69 (1886). Type : Calcutta Botanic Garden (presumably from E. Africa), *herb. Wallich* 1719 (K, lecto. !).

Syn. *Ceratogonum atriplicifolium* Meisn. in Wallich, Pl. As. Rar. 3 : 63 (1832). Type as for species.

O. somalense Chiov., Miss. Stef.-Paol. n. Somal. Ital. 152 (1916). Type : Italian Somaliland, *Paoli* 1323 (FI, holo. !).

O. denhardtii De Wild., Pl. Bequaert. 4 : 313 (1928). Type : Kenya, Takaungu, *Thomas* (*Denhardt*) II, 64 (BR, iso. !).

O. fagopyroides Dammer ex Peter in Fedde, Rep. Beih., 40, 2 : 186 (1932). Type : Kenya, Takaungu, *Thomas* II, 64 (B, lecto. !).

O. atriplicifolium var. *trichocarpum* Chiov., Fl. Somal. II, 380 (1932). Types : Somaliland, *Senni* 599 ! and *Gorini* 385 ! (FI, syns.).

O. somalense var. *pterocarpum* Chiov., l.c., in part (ref. syn. *Senni* 326 !).

Polygonum owenii Bojer in Ann. Sc. Nat. ser. 2, 4 : 267 (1835) *ex descr. et tab.* Type : uncertain.

O. sinuatum has been classed as a variety of this species, but this is a misconception of taxonomic affinities. *O. atriplicifolium* is more strongly heterostylous ; has longer, reflexing, filiform, fruiting pedicels ; has more deltoid, less lobed leaves ; and is altogether much more slender and is perhaps perennial.

O. somalense, here sunk into synonymy, is a form with rather narrower, more lanceolate leaves and hairy fruit. A sandy-soil, maritime form has been collected at Kiunga, Kenya, approximately 10 miles from the Somaliland border, which is, except for the fruits, strongly pubescent and has very narrow, starved leaves with, in some cases, sagittately-lobed bases. The pedicels are however too long (5 mm.) and the inflorescence stalks two slender for *O. sagittatum*, with which this form might otherwise be confused.

O. atriplicifolium has a distinctly coastal and as it seems limited distribution. Apart from its occurrence in Madagascar [*fide* Cavaco in Fl. Madagasc. *Polygonacées*, 7 (1953)—*spec. non vidi*, it appears to be largely restricted to the coastal regions between the Mombasa district of Kenya and Mogadishu, whence all specimens seen have been collected with the exception of a single gathering from Mozambique [*Forbes s.n.* (K !)].

Under this name I include *Gregory s.n.* (BM !) which was collected in Kenya from Golbanti in the Tana Valley. This is a dimunitive example,

with very small leaves and flowers (unfortunately without fruit) with a gnarled, perennial stock and very short, slender, annual shoots. The characters, insofar as they can be assessed, indicate this gathering to be a state of *O. atriplicifolium* induced by fire, or grazing. The leaves are far more hairy than is usual in this species, but this can perhaps be explained as an effect resulting from such circumstances. Var. *trichocarpum* Chiov. is merely a hairy form with densely pubescent fruits.

O. denhardtii and *O. fagopyroides* are obviously duplicates from the same gathering : and both are clearly *O. atriplicifolium*.

17. **O. salicifolium** *Dammer* in Engl., Pflw. Öst.-Afr. C : 171 (1895). Type : Tanganyika, Duga, *Holst* 3186 (B, lecto. ! ; K, isolecto. !).

This species bears some resemblance to *O. fruticosum*, particularly in leaf characters. Apart however from the obvious fruit distinction, *O. fruticosum* is more woody, with raceme stalks 1·5–2 mm. thick (scarcely exceeding 0·6 mm. in *O. salicifolium*) and with bracts that are sometimes terminally esetose. The marcescent flowers of *O. salicifolium* are not more than 3 mm. long, those of *O. fruticosum* being much larger (8–9 mm. long) (a comparison of the lengths of fresh ♂ and ☿ flowers of the two species is not accurately possible from the literature and available specimens, in view of some conflict in evidence).

I include under *O. salicifolium* an example from Lukenya, east of Nairobi [*Bally* 9851 (K !)] which is unfortunately inadequate and fruitless. Like *O. salicifolium*, its creeping stem is woody, and the shoots—including the raceme stalks—are slender. The main difference is that the similar but reduced leaves are rather coarsely pilose with white hairs that impart a paler green colour to the plant as a whole. It is perhaps a form of *O. salicifolium* induced by fire or grazing, in the same analogy as is *Gregory s.n.* with *O. atriplicifolium* (q.v.).

O. salicifolium has a rather restricted range according to present records, which are from the Kilifi and Mombasa Districts of Kenya and the Tanga and Mpwapwa Districts of Tanganyika. If *Bally* 9851 is accepted as this species, it provides an additional record for Kenya, in the Machakos District. Probably the species is more widespread than records suggest.

18. **O. maculatum** *R. Grah.* sp. nov.

Species hirsuta viridi-canescens *O. sagittato* aliquanto affinis, sed foliis maculatis lanceolatis haud sagittatis distinguitur. Type : Kenya, Machakos District, *van Someren* 1599 (K, holo. !, EA, iso. !). Fig. **1** (1).

Herba ? perennis, ramosa. *Caulis* decumbens vel repens, lignosus, teres, sulcatus, ramis annuis floriferis erectis et pilis albis patentibus vel reflexis instructus, in partibus lignosis glabrescens, 30–45 cm. altus vel ultra ; internodiis ad 3 cm. longis. *Ocreae* 6 mm. longae, membranaceae, ut caulis hirsutae, in medio vel in inferiore parte foliosae, apice truncatae setis fuscis hirsutis (basi praecipue) c. 6 mm. longis instructae. *Folia* ambitu lanceolata sed margine crispata leviter lobata, sessilia vel breviter petiolata, apice acuta, basi ad ocreas longe decurrentia, 2–4 × 0·2–1 cm., utrinque albo-pilosa, marginibus purpureis, et superne macula lanceolata purpurea in laminae medio aucta. *Inflorescentia* ± valida, elongata,

erecta vel leviter arcuata, profuse florifera, ad 20 cm. longa (? ultra) ; internodiis ad 2 cm. longis. *Bracteae* 4–5 mm. longae, ± ut ocreae sed setis paucioribus munitae. *Pedicelli* erecti 3–3·5 mm. longi, filiformes, glabri vel leviter pilosi, 2–3-jugati. *Flores* pallide punicei, heterostylosi (stylos longos tantum vidi), c. 5 mm. longi ; tepalis punctatis, 4 mm. longis, lineari-lanceolatis (raro 1 vel 2 late oblanceolatis) ; stylis 3, 4 mm. longis, per 1 mm. connatis ; staminibus 8, illis ad tepala adnatis filamentis 1 mm. longis et illis circum stylum 1·5 mm. longis. *Fructus* fusiformis, 6–6·25 mm. longus, viridis, pilosus, aculeis 3 patentibus vel leviter reflexis 1 mm. longis ex medio vel paululo in inferiore parte munitus.

This species, which is recorded only from the inadequately described type locality (Machakos Distr., at 1710 m.) where it apparently grows in masses, is perhaps one of a complex which includes *O. stuhlmannii* and *O. sagittatum*. Specification being based on vegetative characters is perhaps not very strongly justified, but it is thought best to offer this plant in specific grade until such time as the results of further investigations may warrant other treatment. The red blotch is apparently unusual in this genus, being otherwise only noted—and rarely—in *O. sinuatum*, and this character added to the canescent, small leaves with the long, rather stout, multiflowered racemes gives the plant a rather unusual appearance.

19. **O. delagoense** *O. Kuntze*, Rev. Gen. Pl. 3 : 268 (1898). Type : Portuguese East Africa, Delagoa Bay, *Kuntze* s.n. (NY, holo. ; K, iso. ! ; also certain " authentic " Delagoan material at Kew).

Syn. *O. junodi* De Wild., Pl. Bequaert. 4 : 314 (1928). Type : Portuguese East Africa, Delagoa Bay, *Junod* 25 (BR, holo. !).

This species has many features of resemblance with *O. alatum* of which it may be a form lacking wings on the fruit, pinnately-lobed leaves and cup-like scales, and having smaller fruits, and with *O. dregeanum* (agg.) but the fruits are apparently consistently smaller at maturity—not exceeding 5 mm., and are unwrinkled. Despite the type description " *haud spinosus* ", and " *weder stachelige noch geflügelte Früchte* ", there are often basal teeth, or protuberances which are evidently teeth in a rudimentary state. The leaves are lobed or unlobed, the lamina being linear to elliptic lanceolate or lanceolate and tending to slight lateral asymmetry and arcuation : the lobes are often very asymmetrical.

O. junodi is without doubt the same specis as *O. delagoense*. Wright's description of the latter in F.T.A., to which De Wildeman refers, is scarcely accurate, being based on Kuntze's description with which the isotypic and the bulk of authentic material does not in all respects agree, and this De Wildeman did not appreciate. In fact *O. junodi* is a normal example of *O. delagoense*.

O. delagoense var. *robustum* Kuntze, l.c. 269 ; Fl. Cap. 5. 1 : 462 (1912) was described from a specimen lacking fruit and hermaphordite flowers. *Wilms* 1280 !, referred to in Fl. Cap., appears to be a fragment of a normal *O. delagoense*. But this example is not cited by Kuntze in reference to his variety, indeed it is not even so identified. Authentic var. *robustum* has not been consulted, thus it is not known whether the plant is correctly affiliated to Kuntze's species or not. One is tempted to

regard the variety as one which should be sunk into synonymy with the species.

20. **O. alatum** *Burch.*, Trav. 1 : 548 (1822). Type : South Africa, *Burchell* 2074 (K, holo. ! ; PRE, iso.).

Syn. *O. alatum* var. *incisum* Sond. in Linnaea 23 : 98 (1850), *ex descr.*

O. alatum var. *integrifolium* Sond., l.c. *ex descr.*, excl. syn. *O. dregeanum* Meisn.

O. alatum var. *marlothii* Engl., Jahrb. 10 : 6 (1888). Type : Bechuanaland, Kuruman, *Marloth* 1016 (K, iso. !).

O. acetosella Welw. in Trans. Linn. Soc. 27 : 60 (1869). Type : Angola, Mossamedes, *Welwitsch* 1757 (K, iso. ! ; BM, iso. !).

The wings at maturity provide the fruit with an overall diameter of up to 1·3 cm. but sometimes wings are wholly absent. The faces of the fruit often have a small, ± spreading prickle at c. $\frac{1}{3}$ distance from the base.

An interesting character is provided by the cup-like scales, which have not been detected in any other species of the genus. They do not however always occur, and there is a gradation between total absence and profusion : when present they appear to provide an immediate character for identification.

The var. *marlothii* differs, according to the description, in having rounded, not trigonous fruit. Isotypic material at Kew bears no fruit at all, but in all other respects seems to be a normal *O. alatum.*

O. acetosella differs from *O. alatum* in having less deeply lobed leaves, in the absence of a subulate fringe to the ocreae, and, according to Wright (F.T.A.), in the narrower wings to the fruit. Scales are apparently absent. But the lobing of the leaves, the presence or absence of an ocreal fringe, and the width of the wings are all very variable characters in *O. alatum* ; indeed wings are sometimes absent. In the type specimens of *O. acetosella* the wings do not attain the maximum width of those of *O. alatum*, but those fruit that have them (and many are without any wings at all) fall within the range of width variation of *O. alatum*—as well as in the presence of the small facial prickle.

Sonder's two varieties indicate extremes in the varying integrity or indentation of the leaves ; but forms with intermediate leaf shape occur and the two are scarcely worth varietal distinction. The suggested synonymy of *O. dregeanum* with the entire leaved form is reasonable, as there is perhaps no wholly reliable taxonomic distinction between *O. alatum* and *O. dregeanum* (even allowing for the apparent absence of the scales in the latter species). But on the evidence available it is thought best to regard the two species as distinct.

21. **O. limbatum** *R. Grah.* sp. nov.

Species *O. schliebenii* nonnihil affinis sed ocreis apice limbatis differt. Type : Angola, Lunda, *Exell & Mendonça* 1018 (BM, holo. !). Fig. **2** (5, 6, 7).

Herba ? perennis, omnino pilosa, multiramosa. *Caulis* ut videtur vagans viridis inferne brunneus, sulcatus, pilis leviter reflexis albis munitus ; internodiis 4·5 6 cm. longis. *Ocreae* 6–7 mm. longae, pilosae,

apice limbo folioso patente vel ± reflexo et setis 3–4 mm. longis basi dilatatis instructae. *Folia* ovato-lanceolata vel ovata, 3–4 × 1·4–2·4 cm., apice mucronata, basi decurrentia vel ± abrupte angustata, breviter petiolata, utrinque pilis albis brevibus hirsuta. *Inflorescentia* elongata, ad 50 cm. longa, erecta vel leviter arcuata, ± valida. *Bracteae* pilosae, 4–5 mm. longae, esetosae, truncatae sed postice in apicem lanceolatum productae. *Pedicelli* erecti, pilosi, plerumque 6-jugati, 3 mm. longi ; illi ♂-florum tenues ; illi ♀-florum crassiores elongescentesque. *Flores* 6–6·5 mm. longi ; tepalis extra pilosis, 3–3·5 mm. longis, lineari-lanceolatis, canis, punctatis ; filamentis 3–4 mm. longis ; antheris 1 mm. longis ; stylis 3, 2·5 mm. longis, per 1·5 mm. connatis (stylos breves tantum vidi). *Fructus* 7–9 mm. longus, pubescens, lanceolato-ampulliformis, striatus, transverse rugosus.

In general appearance this species resembles *O. schliebenii*, but the unarmed fruit, short pedicels and generally hirsute state serve for immediate differentiation. The spreading, terminal limb of the ocreae is a feature not noticed in any other species of the genus, except rather rarely in certain examples of *O. dregeanum* var. *dregeanum* and var. *canescens*, where the apex of the ocreae sometimes tends to bend irregularly outwards and to reflex.

So far only known according to this single example, collected from subxerophytic forest " between Vila Henrique de Carvalho and Dala, near R. Luachimo, c. 1300 m., April 1937 ".

22a. **O. dregeanum** *Meisn.* in Linnaea 14 : 487 (1840). Type : neighbourhood of Omsamculo (location uncertain).

var. **dregeanum.** Type as for species.

Syn. *O. dregei* Meisn. in DC. Prodr. 14 : 38 (1856). Type : Port Natal, *Krauss* 283 (K, lecto. !).

O. natalense Schlechter in Engl., Jahrb. 40 : 92 (1907). Type : Natal, Alexandria, *Rudatis* 74. *Spec. e loc. typic. tantum vidi.*

O. dregeanum appears to be a very variable species, varying in leaf-shape, ocreal fringe, size of flower, degree of polygamy, and size, shape and ultimate position of fruit. Experimental taxonomy, particularly the growing under observation of different forms previously graded as species but offered here as varieties, is badly needed in order that this complex species may be more clearly understood.

Var. *dregeanum*, according to the type specimen, is usually a short, rather stocky, glabrous plant, usually with entire narrowly oblanceolate or linear leaves—broadening in lush examples to oblanceolate. The flowers are large, typically 6–8 mm. long, and seem to incline to hermaphrodism more than any other species of the genus. The fruits of var. *dregeanum* seem often to be pendulous, and sometimes bear basal protuberances and narrow wings : in the first case a transition to var. *canescens* is indicated, while the second perhaps indicates a close affinity to *O. alatum*—but it should be noted that transverse wrinkles do not characterise the fruit of *O. alatum* as they do *O. dregeanum* (although in the former species they do rarely and rudimentarily occur).

22b. **O. dregeanum** var. **swazicum** (*Burtt Davy*) *R. Grah.* comb. nov. Type : Swaziland, *Stewart s.n.* (K, holo. !).

Syn. *O. zeyheri* var. *swazicum* Burtt Davy, Fl. Transv. 1 : 167 (1926). Type as for *O. dregeanum* var. *swazicum.*

This variety resembles var. *dregeanum* in its large flowers and pendulous fruit, and tendency to hermaphrodism, but differs markedly in its very deeply linear-lobed leaves.

22c. **O. dregeanum** var. **strictum** (*C. H. Wright*) *R. Grah.*, comb. nov. Type : (East side of Lake) Tanganyika, *Scott-Elliot* 8365 (K, holo. ! ; BM, iso. !).

Syn. *O. delagoense* var. *strictum* C. H. Wright in F.T.A. 6, 1 : 100 (1909). Type as for *O. dregeanum* var. *strictum.*

O. pubescens C. H. Wright l.c. (March 1909); and in K.B. 1909 : 187 (May 1909). Type : S. Rhodesia, Mashonaland, between Salisbury and Headlands, *Cecil* 155 (K, lecto. !).

O. dregeanum var. *pubescens* (C. H. Wright) Burtt Davy, Fl. Transv. 1 : 167 (1926). Type as for *O. pubescens.*

Var. *strictum* is told from var. *dregeanum* by being usually a taller plant, with a less congested raceme ; by its shorter tepals and thereby smaller flowers ; and from var. *swazicum* by its unlobed leaves, smaller flowers, any less congested racemes ; and from both by being more markedly podlgamous. It is not claimed, however, that any of these varieties are very clearly definable.

This variety is characterised by the unlobed leaves (very rarely extremely rudimentary lobing of the leaves occurs) and unarmed fruit. It is clearly perennial, having a thick, woody, perennial stock that sends up herbaceous, annual shoots—probably after fires. In degree of hairiness it varies from thickly tomentose to glabrous. Various collectors have noted blue anthers in this variety : it is however not known whether the character is a reliable one.

Var. *strictum* is unsatisfactorily affiliated by its original author to *O. delagoense.* The fruit of the latter are smaller and unwrinkled at maturity, and although in the type of var. *strictum* the available fruit appear to be unwrinkled, nevertheless rudimentary wrinkles can be seen if the immature fruit is carefully examined : also, even in the immature stage, the fruit are too long. In typical var. *strictum*, the fruits are practically glabrous : in other examples they vary to thickly pubescent. There is considerable resemblance between type var. *strictum* and *O. tenerum.* The latter, however, has fruits wholly unwrinkled at maturity, longer tepals, and longer anthers.

22d. **O. dregeanum** var. **canescens** (*Sond.*) *R. Grah.* var. nov. Type : Transvaal, Aapjesrivier, *Zeyher* 1451[a] (W, holo. !).

Syn. *O. canescens* Sond. in Linnaea 23 : 100 (1850). Type as for variety.

? *O. canescens* var. *subglabra* Schinz in Bull. Herb. Boiss. 4, App. 3 : 57 (1896). Type : Amboland, between Olukonda and Uakuambi, *Schinz* 2058.

O. zeyheri Sond., l.c. Type : Transvaal, Magalisburg, *Zeyher* 1451[b] (W, holo. !).

O. calcaratum Meisn. in DC. Prodr. 14 : 38 (1856). Type : Bechuanaland, " near the source of Kuruman river ", *Burchell* 2459 (K, holo. !).

This variety is clearly very closely allied to var. *strictum*, but differs in having lobed leaves and armed fruit. The depth of lobing is very variable, being sometimes reduced to lateral teeth scarcely 1 mm. long. The fruit are armed with spreading or (especially when mature) reflexing prickles, either long and very sharp or short and obtuse ; and the position of the prickles varies from just above the base in immature examples to ± basal in those that are older. Oppositely to var. *strictum* where the fruit are unarmed and the leaves unlobed, the lobed leaves and armed fruit of var. *canescens* seem to correlate in most cases where fruits are available, and the cases where unarmed fruit occur with lobed leaves indicate that the two varieties are probably not separable on other than superficial characters.

It is scarcely possible to differentiate between the types of *O. canescens* and *O. zeyheri* (both of which are fruitless) by any reasonably good character. The " pedunculisque semper solitariis ", claimed for *O. zeyheri* in the type description is not confirmed by the type specimen where two peduncles together are visible in at least one case—it is, however, a few-flowered variant. The two epithets have equal validity : *O. canescens* has been chosen for retention in varietal grade owing to a personal preference.

O. calcaratum, here reduced to synonymy, is usually attributed to Burchell, but the name does not appear either in his Travels nor in the copy of his Catalogus which has been consulted. If the binomial occurs in another copy of the Catalogus it is almost certainly as *nomen nudum* : for this reason Burchell's name is herewith discarded.

With regard to *O. canescens* var. *subglabra*, type of which has not been consulted, it is to be noted that *Schlechter* 4194 (BM !, W !), identified as this variety, appears to be *O. sinuatum*.

22e. **O. dregeanum** var. **wittei** (*Staner*) *R. Grah.* var. nov. Type : Belgian Congo, Dilolo, *de Witte* 629 (BR, holo. !).

Syn. *O. wittei* Staner, Rev. Zool. Bot. Afr. 21 : 329 (1932) ; De Wild. & Staner, Contrib. Fl. Katanga, Suppl. 5 : 21 (1933).

O. overlaetii Robyns in Bull. Jard. Bot. Brux. 17 : 162 (1944). Type : Belgian Congo, Kapanga, *Overlaet* 827 (BR, holo. !).

Staner's species seems to fit into the range of variation of *O. dregeanum* (agg.) due to its transversely wrinkled, unarmed fruit, with very narrow wings. I find it difficult, however, to reconcile Staner's plant with *O. acetosella*, as De Wildeman suggests, not only due to the differences he gives but also to the marked difference in the fruit which in *O. acetosella* are smooth and unwrinkled. Var. *wittei* is clearly perennial with a gnarled, thick stock emitting annual shoots, whereas the type specimen of *O. acetosella* has every appearance of being annual. Within the aggregate species *O. dregeanum*, var. *wittei* is closest to var. *strictum*, from which it

differs in the narrowly-winged fruit, and broader, oblanceolate or narrowly oblanceolate leaves.

O. overlaetii is so similar to *O. wittei* that notwithstanding the differences given in the type description, a sinking into synonymy is apparently justified. Type *O. overlaetii* is a very immature plant, but although the fruit appears to be narrowly winged it is scarcely possible to state definitely that its ultimate form will be trigonous, as is suggested in the type description. In fact *O. overlaetii* is described on insufficient material, and the distinctions given are scarcely adequate to justify specific separation from *O. wittei*, which is a somewhat less lush plant.

23. **O. fruticosum** *Dammer ex Milne-Redhead* in K.B. 1933 : 142 (1933). Type : Northern Rhodesia, Mwinilunga District, about 40 miles S. of Mwinilunga and 12 miles W. of R. Lunga, *Milne-Redhead* 947 (K, holo.!).

Syn. *O. callensii* Robyns & Petit in Bull. Jard. Bot. Brux. 24 : 6 (1954). Type : Belgian Congo, Panzi, *Callens* 1919 (BR. holo. !).

This is a bushy species, with woody stems and large, showy flowers with spreading, petaloid tepals, wine-red outside, and white within. There is a certain resemblance in the foliage to the much more slender *O. salicifolium* (q.v.).

This species is known from Northern Rhodesia, Angola, and the Belgian Congo. In addition to the records in K.B., it has been found in N. Rhodesia at Kabompa [*Holmes* 1142 (K !)] ; and in Angola at Dala [*Exell & Mendonça* 1429 (BM, !)] and at R. Chiji [*Exell & Mendonça* 1185 (BM, !], both in the Lunda area. For additional Belgian Congo records, see Robyns and Petit in Bull. Jard. Bot. Brux. 24 : 6 (1954).

O. callensii seems to be merely a form of *O. fruticosum* that differs in having considerably hairier leaves and longer tepals. As regards hairiness, *Russell* 37 [Belgian Congo, Biano plateau (K !)] stands intermediate between the two ; and with regard to the flower characters, the tepals being 2 mm. longer than those of typical *O. fruticosum* is scarcely adequate as a character on its own for specific differentiation. The perianth tube of *O. fruticosum* is 6 mm. long, that of *O. callensii* 8 mm., while in *Russell* 37 it is 7 mm., again showing intermediacy. Probably *O. callensii* is a hirsute form of *O. fruticosum*, induced by circumstances—it is recorded from " *savane recemment brulée* ".

24. **O. tenerum** *Milne-Redhead* in Hook., Ic. Pl. 33 : t. 3216 (1933). Type : Northern Rhodesia, Mwinilunga District, sandy plain east of Mwinilunga, *Milne-Redhead* 1115, (K, holo. !). Also in Belgian Congo.

This species is clearly perennial, with a rather short, gnarled stock, and annual shoots not more than 8 cm. tall, suggesting annual burning. Its resemblance to *O. dregeanum* var. *strictum* has been already mentioned (q.v.). It would be interesting to grow this plant under conditions where normal development would not suffer interference. See also Robyns and Petit in Bull. Jard. Bot. Brux. 24 : 4–5 (1954).

25. **O. pachybasis** *Milne-Redhead* in Hook., Ic. Pl. 33 : t. 3215 (1933). Type : Northern Rhodesia, Solwezi District, Solwezi, in dambo, after burning, *Milne-Redhead* 1162 (K, holo. !).

The type material is thickly pubescent with short shoots scarcely exceeding 20 cm. in length, but more glabrous material which I have not seen is reported from Belgian Congo—[*vide* Robyns in Bull. Jard. Bot. Brux. 17 : 163 (1944)].

Typical material has also been collected from Solwezi in N. Rhodesia [*Fanshawe* 240 (K !)].

26. **O. lineare** *De Wild.*, Pl. Bequaert, 4 : 315 (1928). Type : Belgian Congo, Kandale, *Vanderyst* 3280 bis (BR, lecto. !).

The bottle-shaped, unusually small fruits without a trace of wrinkles or armament render this species different from all others of the genus. De Wildeman's suggestion of its affinity with *O. delagoense* var. *strictum* (q.v. *O. dregeanum* var. *strictum*) is reasonable by comparison of the foliage, but the fruits are markedly different.

Apart from the type record, this species has been collected in the Belgian Congo at Kinsiele, [*Vanderyst* 5438 (*fide* De Wild.) (BR)], and in Angola at Dala, in Lunda, [*Exell & Mendonça* 1455 (BM !)]. In the last record, the leaves are the broadest yet seen, attaining 9 mm., while in the other examples the width does not exceed 2·25 mm. Whether 9 mm. is unusually broad or not is uncertain. The length attains at least 7 cm.

27. **O. ovalifolium** *Robyns & Petit* in Bull. Jard. Bot. Brux. 24 : 7 (1954). Type : Belgian Congo, Kasai, between Panzi and Wamba, *Callens* 2736 (BR, holo. !).

It is possible that this species is merely a luxuriant-leaved form of *O. vanderystii*. The fruits, habit, and the shape of the immature leaves are very alike, and the differences lie in the hairy pedicels, raceme stalks, ocreae, petioles, and leaf midribs and edges, and particularly in the clear petioles (up to 2 cm. long) which are lacking in *O. vanderystii*, and in the more abruptly attenuate leaf bases. In the type description, *O. ovalifolium* is likened to *O. buchananii* and to *O. pachybasis*, but the affinity to either is erroneous—*O. buchananii* is a glabrous plant with larger leaves, more long-attenuate leaf bases, and long-extended racemes ; while *O. pachybasis* has a different fruit. Further collecting of *O. vanderystii* and *O. ovalifolium* may show them to be conspecific.

28. **O. vanderystii** *Robyns* in Bull. Jard. Bot. Brux. 17 : 161 (1944). Type : Belgian Congo, Kasai, Panzi, *Vanderyst* 16045 (BR, holo. !).

I include under this species *Brenan & Greenway* 8197 from N. Rhodesia, Fort Rosebery district, near Chipili Mission (K !, EA !), which has an identical fruit, is essentially glabrous, and differs from type *O. vanderystii* only in having a whitish midrib to the leaves, and in being apparently procumbent. It is, however, possible that the growth form—typical *O. vanderystii* appears to be erect—may be due to conditions and it is not considered justified to name *Brenan & Greenway* 8197 as a new species on this character alone.

29. **O. gramineum** *R. Grah.*, sp. nov.

Ab omnibus speciebus foliis angustissimis teretibus gramineis cum fructibus triaculeatis differt. Typus : Angola, Moxico district, between

R. Mumbala and R. Namavumba, *Milne-Redhead* 4009 (K, holo. !). Fig. **2** (3, 4).

Herba perennis radicibus nodosis et caulibus annuis instructa. *Caulis* erectus rigidus, ad 60 cm. longus, viridis vel leviter fuscus, sulcatus, glaber ; internodiis ad 8 cm. longis. *Ocreae* anguste infundibuliformes, membranaceae, c. 2 cm. longae, glabrae, in inferiore parte foliosae, apice setis validis erectis subadpressis 5–7 mm. longis munitae. *Folia* carnosa teretia sessilia erecto-patentia, angustissime linearia, graminea, 5–7 cm. longa et ad 1 mm. lata, glabra, apice acute mucronata non aristata. *Inflorescentia* elongata, ad 28 (? ultra) cm. longa, leviter arcuata vel stricta, infra (i.e. ex summa caulis ocrea) saepe bifurcata ; internodiis 1–5·2 cm. longis. *Bracteae* ut ocreae sed efoliosae, 5-11 mm. longae, apice setis 3–5 mm. longis munitae. Pedicelli 2–4-jugati, glabri ; bractearum setas non vel vix excedentes. *Flores* heterostylosi (stylos breves tantum vidi) ; tepalis albis, 4·5 mm. longis, oblongis, apice variabiliter angustatis et cucullatis ; filamentis 3·5 mm. longis albis glabris ; antheris 0·75 mm. longis subreniformibus ; stylis 3, 2 mm. longis, basi non connatis ; stigmatibus capitatis. *Fructus* (immaturus tantum) flavo-viridis, glaber, fusiformis, aculeis 3 validis 2 mm. longis ex medio (? vel supra) munitus.

This species, which is known only from the type locality where it occurs on " lateritic " gravel overlying " laterite ", has a superficial resemblance to *O. lineare* in its leaf-shape ; but the fruit of the latter is bottle-shaped and unarmed, and the ocreae have no fringing setae or only the shortest, whereas in *O. gramineum* the setae are long and bristly. The immature fruits taper lengthily to the base, and the overall length is perhaps c. 1 cm. at maturity. So far as can be certainly ascertained the pedicels of the maturing fruit do not elongate, but the long base of the fruit gives the appearance of an elongation.

Uncertain species.

O. dentatum Burch. *nom. nud.*

Mentioned by Meisner in conjunction with *O. alatum*, in Linnaea 14 : 488 (1840). No description traced. The fragment stated to be in herb. De Candolle has not been consulted.

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Field Guide to Ferns.*—Mr. Cobb's guide to the ferns and allied groups of northeastern and central North America is one of the Peterson Field Guide Series. The author is not a professional botanist but a business man with an enthusiastic interest in ferns. The book is profusely illustrated with full page figures of every species and the artist, Mrs. H. L. Foster, is to be congratulated on her most detailed and delicate drawings.

The keys are pictorial, being based on silhouette drawings of fronds and sketches of sporangial arrangements, and in conjunction with the full page illustrations should make identification relatively simple.

The field covered is, perhaps, a little ambitious for a book of its kind since there are chapters on classification, the fossil record, ferns for the garden and the ferns of Britain and Western Europe. The extract from Wagner's paper on the Appalachian Aspleniums given on page 51 will certainly be " Greek " to many readers to whom such terms as " allopolyploid ", " meiotic metaphase ", " diploid " and other examples of cytological nomenclature will be meaningless.

It is regrettable that a number of inaccuracies have crept into the book. Some are due to oversimplification of fact, a common fault in popular works, but many to a misunderstanding of fern morphology and terminology. Others can only be described as slips.

It is certain, however, that Mr. Cobb's book will be widely used in its country of origin. It is admirably produced, of a convenient size and well illustrated. If it serves to awaken interest in a rarely publicised group of plants it will have achieved its purpose.

F. BALLARD.

* A Field Guide to the Ferns by Boughton Cobb, Houghton Mifflin Company, Boston, 1956, pp. 281, copiously illustrated, $3.75.

SOME SPECIES OF CLEOME.*

S. M. H. Jafri

Cleome Linn. is a large genus of Capparidaceae with about 200 species distributed mostly in the tropical and subtropical regions of the world. It is represented by only 9 species, *C. scaposa* DC., *C. quinquenervia* DC., *C. griffithiana* Rech. fil., *C. dolichostyla* Jafri (sp. nov.), *C. rupicola* Vicary (= *C. stocksiana* Boiss.), *C. viscosa* L., *C. brachycarpa* Vahl, *C. ornithopodioides* L., and *C. heratensis* Bunge and Bien., in W. Pakistan, Afghanistan and N.W. Himalaya. Of these one, *C. dolichostyla*, is new to science and the three others, *C. ornithopodioides* L., *C. griffithiana* Rech. f. and *C. heratensis* Bunge & Bien are additions to the Hooker's Flora of British India. *C. stocksiana* Boiss. must be replaced by *C. rupicola* Vicary.

The two species, *C. rupicola* and *C. fimbriata*, were published as new species from Sind (now in W. Pakistan) by Vicary in Jour. Asiatic Soc. Bengal (1847) and republished in Ann. Nat. Hist. II, i, 425 (1848). I have seen only the latter reference and the same is given in the Index Kewensis. It appears to have been overlooked by the authors of the Indian Floras who do not mention these even as synonyms in their publications. I have examined Vicary's specimens of these species at Kew and find *C. rupicola* Vicary (1848) to be conspecific with *C. stocksiana* Boiss. (1853). The former being earlier, therefore, is the valid name. Vicary's specimen, however, from Sind is marked as *C. stocksiana* Boiss., but is no doubt the type specimen of his *C. rupicola*. The other species, *C. fimbriata* Vicary is conspecific with *C. quinquenervia* DC.

Hooker fil. and Thomson (Fl. Brit. India, 1872) include *C. noeana* Boiss. as synonym of *C. quinquenervia*, DC. but there is no doubt they are distinct species, the former having a much elongated many flowered bracteate raceme. Other characters like the short style (2–4 mm. long) and short fruits are more or less similar in both the species. Bracts in both the species show a wide range of variation : from leafy to reduced or almost rudimentary condition ; sometimes they may be altogether suppressed. *C. noeana* Boiss. has not yet been recorded from the present area*. Griffith's specimens from Afghanistan (Herb. East India Co. no. 166) included under *C. quinquenervia* by Hooker fil. and Thomson in Fl. Brit. India (1872) has now been separated as a separate species, *C. griffithiana* Rech. fil., by Rechinger fil. Rechinger's type specimen of this species is in a bad state. Isotypes of this species at Kew are in a much better condition. This species is distinguished from *C. quinquenervia* DC. by its robust habit, with an inflorescence 20–40 cm. long in fruits, fruits elongated and upcurved, pedicels short and thickened. Thus they also differ from *C. noeana* Boiss. by having robust habit and elongated fruits with thickened, short pedicels. Style in this species is only 2 mm. long.

I have found two collections, one from Persia and the other from lower Baluchistan (W. Pakistan) (labelled as *C. quinquenervia* DC.) which are remarkably distinct in their size of style (being 9–12 mm. long) although they reach very near to *C. quinquenervia* and *C. noeana*. These have been

* S. M. H. Jafri, " Taxonomic Study on Capparidaceae and Cruciferae of West Pakistan, Afghanistan and N.W. Himalaya ", Ph.D. Thesis, Univ. of Edinburgh 1954.

described as new species, *C. dolichostyla*, here. The type specimen of this species is from Persia but it has also been recorded from lower Baluchistan (W. Pakistan). The plant from Baluchistan is much smaller in size and somewhat also differs in indumentum from Persian plants, but the size of style is remarkably similar in both. More record from Baluchistan can only decide its infra specific status. I did not find any specimen of *C. quinquenervia* DC. from Baluchistan.

1. **C. griffithiana** *Rech. fil.* in Ost. Akad. Wissen. nr. II, 2 (1950).

Type : Afghanistan, *Griffith*, Herb. East India Co. no. 166 (V !, K !).

Geog Dist. :

W. Pakistan : Peshawer, *J. L. Stewart* (K !).

Afghanistan : Khyber pass, 540 m., between Baghon and Barisoat, *Griffith* 1428 (Herb. East Ind. Co. no. 166) (K !). Manoo, *Griffith*, Herb. East Ind. Co. no. 134 (K !).

2. **Cleome dolichostyla** *Jafri*, sp. nov.

Affinis *C. noeanae* Boiss., sed stylo valde longiore sepalis persistentibus divergit.

Herba perennis, 15–30 cm. alta, erecta, ad basin sparsim ramosa ; pilis simplicibus glandulosis et eglandulosis obsita. Folia simplicia, inferiora suborbiculata 2–4·5 × 1–2·5 cm. (petiolo circa 1 cm. longo incluso) 5–7- palmato nervosa ad apicem rotundata, superiora bracteiformia. Racemus 15–30-florus laxus elongatus, in fructu 15–25 cm. longus bracteatus ; bracteae ± orbiculatae inferiores breviter petiolatae vel subsessiles superiores sessiles vel subsessiles. Flores circa 5 mm. diam. pallide lilacina, pedicelli 3–6 mm. longi in fructu circa 10 mm. longi, divaricati. Sepala 3–4 × 1–2 mm. linearia acuta persistentia. Petala 4–6 × 1·5–2 mm. oblonga ad basin cuneata ad apicem acuta. Stamina quatuor 5–7 mm. longa; antherae circa 1 mm. longae. Fructu 18–25 × 4 mm. (stylo 9–12 mm. longo excluso) oblongo-ellipsoideae acutae vel subobtusae subdivaricatae plerumque arcuatae ; valvae pilis glandulosis vestitae. Semina numerosa suborbiculata circa 0·7–0·9 mm. diam. brunea subgranulata glabra.

Persia : Masjide Sulaiman, *A. J. Lee* (K !).—*Type.*

W. Pakistan : Coast of Baluchistan (Makran), *Pierce* (K !).

3. **C. rupicola** *Vicary* in Ann. Nat. Hist. II, i, 425 (1848).

Syn : *C. stocksiana* Boiss., Diagn. Ser. II, i, 47 (1853).

Type : Sind (W. Pakistan), lower hills, *Vicary* (K !).

Geog. Dist. :

W. Pakistan : Bannu, *Drummond* 15085 (K !) ; Mt. Shaikh Boodeen, 600 m., *J. L. Stewart* (K !) ; Boogta hills, *Vicary* (K !) ; (without locality), *N. A. Dalzell* (K !).

Afghanistan : Bolan pass, on limestone rocks, *Griffith* 1426 (K !).

4. **C. ornithopodioides** *L.*, Sp. Pl. 672 (1753).

Type : Not precisely designated.

Geog. Dist. :

W. Pakistan : Chitral, Utzum, 1650 m., *Toppin* 747 (K !). Waziristan. *J. L. Stewart* (K !).

Afghanistan ; N.W. Himalaya, Persia, Armenia, Turkey, Cyprus and *N. Africa.*

5. **C. heratensis** *Bunge et Bien.* in Boiss., Fl. Or., i, 412 (1867).

Type : Afghanistan ; Herat, *Bunge* (G, K !).

Geog. Dist. :

W. Pakistan : Ahmadwal, *V. P. Dutta* 5 (R !).

Afghanistan : Herat, *Bunge* (K !).

In the accomplishment of the present work I am highly indebted to the late Prof. Sir W. W. Smith, Dr. P. H. Davis and the Keepers of the Herbaria at Kew, B.M., Edinburgh and Rawalpindi.

THE TYPIFICATION OF HAYNEA OVALIFOLIA SCHUM. & THONN.

(**Urticaceae**)

R. W. J. Keay

The genus *Haynea* was described by Schumacher in Beskr. Guin. Pl. 406 (? 1827) and in Kongel. Dansk. Vid. Selsk. Naturvid. & Math. Afh. 4 : 180 (1829).

The only species, *H. ovalifolia* Schum. & Thonn., was based on a plant found by Thonning near Aquapim in what is now Ghana (formerly Gold Coast). The name *Haynea* is illegitimate because of the earlier *Haynea* Willd. Sp. Pl. 3 : 1787 (1804), itself an illlegitimate new name for *Pacourina* Aubl. Pl. Gui. 2 : 800 (1775) in the *Compositae.*

H. ovalifolia is quoted as a synonym of *Fleurya podocarpa* Wedd. (1869) by Rendle in the Flora of Tropical Africa 6, 2 : 251 (1917). Dandy, realising that *Haynea ovalifolia* Schum. & Thonn. is the earlier name, made the new combination *Fleurya ovalifolia* (Schum. et Thonn.) Dandy, in F. W. Andr. Fl. Pl. A.-E. Sudan 2 : 277 (1952), to replace *F. podocarpa.*

After his visit to Copenhagen in July 1955, Mr. C. D. Adams showed me his photograph of a specimen named *Haynea ovalifolia* in the Schumacher Herbarium. As this showed a plant quite different from *Fleurya podocarpa*, I obtained the specimen on loan at Kew, through the courtesy of Prof. Hagerup. There are three specimens in the folder, all much alike and probably from the same gathering. One is marked as coming from Herb. Vahl and another from Herb. Hornemann. The specimen from Herb. Hornemann is written up as " *Haynea ; e Guinea, Thonning* ", initialled by F. Didrichsen. The Herb. Vahl specimen is written up in an early hand as " *Haynea ovalifolia, Beskr. af guineiske Planter ; Thonning, e Guinea* ". The third specimen, presumably from Herb. Schum. also bears the name " *Haynea ovalifolia* ", in what I take to be Schumacher's writing, as well as an earlier name " 264, *Urtica ? guineensis* " ; it too is attributed by Schumacher to Thonning from Guinea.

These specimens are all in fruit and agree quite well with the type and more recent material of *Urera mannii* (Wedd.) Benth. & Hook. f. ex Rendle, based on *Scepocarpus mannii* Wedd. (1869). At first sight, therefore, it seemed that Rendle was wrong in quoting *Haynea ovalifolia* as a synonym of *Fleurya podocarpa*, and that it would in fact provide the earliest epithet for *Urera mannii*. When, however, the original description of *Haynea ovalifolia* is studied, quite a different conclusion seems inevitable.

The specimens disagree with the description in at least the following points :—(1) they are in fruit only, whereas the description includes many details about both male and female inflorescences and flowers, (2) the fruits are not marginate, (3) the female calyx is not " *quadrifidus, acutus* ". Moreover the distinctive, widely cymose infructescence bearing setae, and the large, persistent, tubular calyx of the Thonning specimens are not referred to in the description.

On the other hand the description agrees remarkably well with *Fleurya podocarpa* even in some quite small and unusual features, such as the transversely rugose filaments.

It is clear therefore that the three specimens referred to above cannot be taken as types of *Haynea ovalifolia*, which, for the time being, is known only from the description. In view of the fact that one specimen appears to be written up as *Haynea ovalifolia* by Schumacher himself, I suggest that the following explanation is at least possible. When Schumacher prepared the manuscript for publication, he did not have before him the specimen upon which Thonning, 20 years or so earlier in Guinea, had based his long and careful description of the plant later known as *Fleurya podocarpa*, instead he had the specimens of what we now call *Urera mannii*, and failing to check with Thonning's description assumed that they were the same plant. Schumacher's description of the genus *Haynea* and his diagnosis of the species are clearly taken from Thonning's description and not from the specimens which Schumacher himself named. It is of course possible that the specimens upon which Thonning based his description may come still to light. In the meantime it seems wise to maintain Dandy's use of the name *Fleurya ovalifolia* for the plant long known as *F. podocarpa*, because the description does fit remarkably well this plant which is known to grow in the area where Thonning collected.